THE IRON TRADE REVIEW

A JOURNAL OF THE IRON, STEEL, MANUFACTURING AND TRANSPORTATION INTERESTS OF THE CENTRAL WEST.

VOLUME XXI. CLEVELAND, O., OCTOBER 25, 1888. NUMBER 44.

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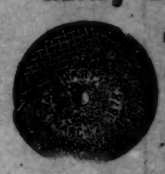

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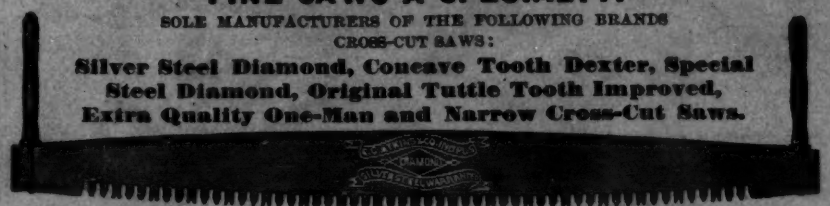

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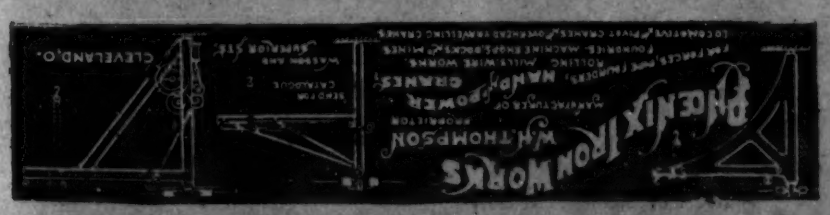

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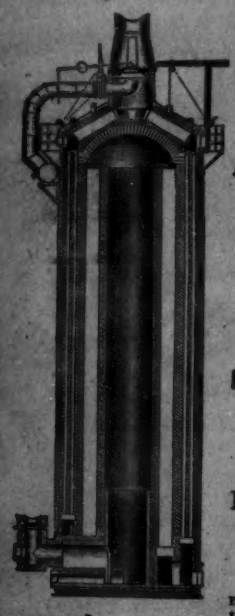

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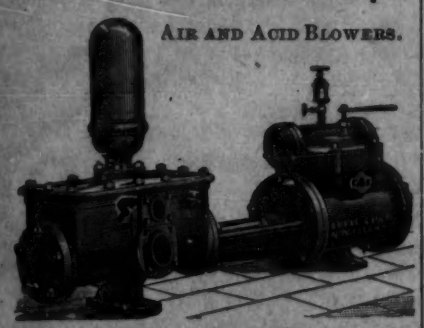

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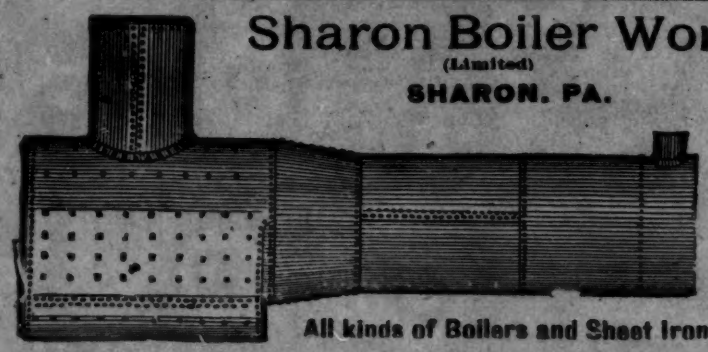

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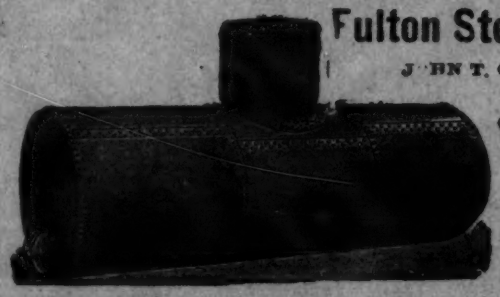

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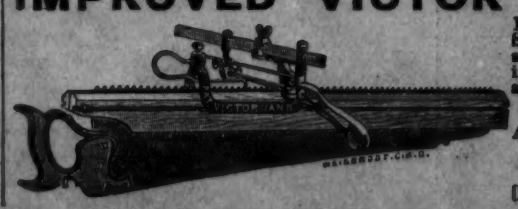

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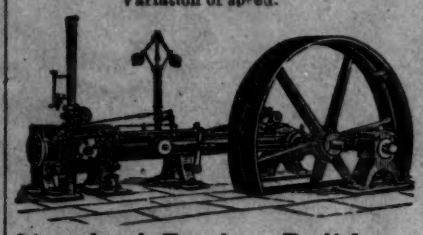

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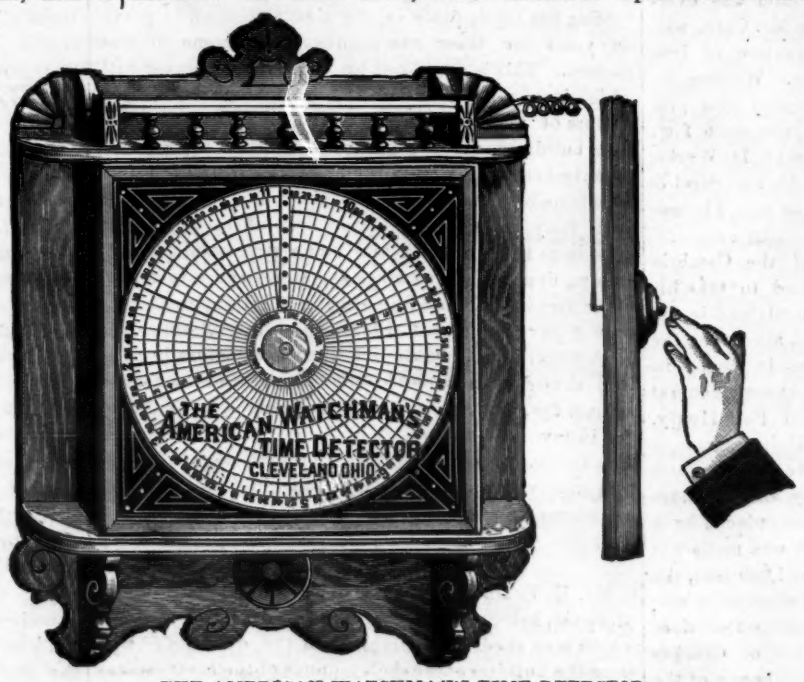
VOLUME XXI. CLEVELAND, O., OCTOBER 25, 1888. NUMBER 44.

THE AMERICAN WATCHMAN'S TIME DETECTOR.

The American Watchman's Time Detector is designed to keep an exact record of the doings of the night watchman in any establishment where it is in use. The instrument, closed with a Yale lock, is placed in the office and connected by insulated electric wires to push buttons or key buttons placed in different parts of the premises where the watchmen are required to pass. As the watchman passes on his rounds he operates each button in turn, and this is instantly recorded in the detector in the office, showing where each watchman is, and when he is at each station or button.

The record is made on a paper dial twelve inches in diameter (shown in cut), which revolves on time by a clock movement. The record is made by needles, each punching a hole through the paper dial, one of which is operated by each key button. If the button is operated, a record is made; if it is not touched, no record is made.

A new dial is put on every morning, so that a daily record is kept of the doings of the night watchman. Any number of stations may be connected to a single instrument and from any distance, and for any number of watchmen; one dial keeps the whole record, which can be read at a glance. As each station is independent of the others, it shows which are visited and which are not. Each ring on the dial corresponds to a station, so that a nine-station system has nine circles on the dial, and fifty-station system a dial with fifty circles, etc., and if five men were to make a record on this (fifty-station instrument), each one having ten stations, the record of the first watchman might be made to appear on the ten outside rings of the dial, the record of the second man on the next ten rings, and so on, so that all of the men can be making their rounds at the same time; and still a record for each one will appear on the dial entirely distinct and independent of the others, as one station has no connection with the others. It makes no difference how many watchmen are employed; there is a separate record for each, and one watchman cannot make a record for the others without it being recorded on the dial. We have instruments keeping a record of thirteen watchmen on a single dial, and the whole is read at a glance. There is no possible way of making the record except by operating the button. It is mechanically so simple that it is not liable to get out of order, and when once put in operation requires little attention. It can be put in position by any competent mechanic. It is impossible to tamper with it in any way without certain detection. The wire is cabled both inside and outside and covered in exposed places. Manufactured by the Cleveland Electrical Manufacturing Co., Cleveland, O.



THE AMERICAN WATCHMAN'S TIME DETECTOR.

Tools, Like Men, Get Tired.

Iron Industry Gazette.

I have seen a first-class chisel get tired and act as though it was possessed of the King of Sheol. It would not keep its edge, and the more I sharpened it, the sooner it would lose its edge. I called the attention of a shopmate, a grizzled old veteran, to the peculiar behavior of the chisel. He looked it over and handed it back to me, saying: "The tool is all right, only a little tired. Lay it away and let it rest. It will come out all right again, just like a man who is tired." I did not believe the old fellow, and I really thought he was crazy to talk of a tool getting "tired," but as there was no help for it, the tool was laid away. I do not remember how long it was left to rest, but when it was again sharpened and used it appeared to hold its keenest edge as well as before it got tired. Barbers tell me their razors in constant use get tired in the same way, and woodchoppers say their axes sometimes seem to get soft all at once. Possibly constant and hard usage may cause changes in crystallization that would account satisfactorily for the peculiarity alluded to. Locomotive engineers often observe peculiar misbehavior in their machines, which possibly may be the result of continued heating, friction, and pounding. When a tool gets "tired," or a machine "balky," give it a rest.

Canal Between Lakes Michigan and Superior.

Willian H. Morrell, of New York, who is working in the interest of the proposed ship canal uniting lakes Michigan and Superior, was in the city yesterday on his way to New York. He said: "I have just returned from looking over both routes proposed, the Big Bay De Noque and the Little De Noque. I incline to think that the latter is best, and will so report. Our present plan is to run the canal from Escanaba and Gladstone to Mursing, on Lake Superior. There we can get an excellent harbor, sheltered by Grand Island, Marquette and Escanaba on either shore, have subscribed equal amounts to put through new and accurate surveys. The line as now projected, will be about thirty-six miles long, and a lock of from eighteen to twenty feet will cover the rise. The country is favorable, as we can use the channel of the White Fish river about two-thirds of the way across, and at the divide there is a small lake which will serve as a reservoir and feeder for our lock. The surveys will be pushed at once, and the matter will be brought before Congress at the next session. The canal will do away with the long and tortuous journey through the straits and Soo. In the trip between Chicago and Duluth, 271 miles will be saved, or 542 on the round trip with all that implies in wages, insurance, etc." —[Marine Record.

THE first iron made in New Jersey was at a place just south of Trenton, from the limonite or bog ore that abounds in that section, and the first forgemaster was Governor Lewis Morris, who came to Monmouth from Barbadoes before the year 1680. When the revolution came on, the iron men had grown skillful enough to make cannon and shells for the continentals; also big shallow pans in which to evaporate sea water and supply salt when the foreign article was cut off.

A BRAZILIAN FOREST.

The great forest plains of Brazil, says Dr. Busby, a traveler in that region, if they were grass covered would present an appearance very similar to that of our own prairies, except that over the greater portion the surface of the country is so level that there is little to separate the rivers. During part of the year very little traveling occurs in this country. The rivers, which unite to form the Madeira, in this section at certain seasons of the year all unite to form one vast lake and a greater part of the country is under water. It is no uncommon occurrence to see the water flowing up streams as the level of a stream is raised higher than that of the other which ordinarily flows into it, by means of additions higher up. The smaller streams have an almost imperceptible current. They are extremely deep and narrow. I have parted the brush from the mouth of a stream which was narrow, but which had a depth of 15 or 20 feet. The banks of this stream would be so covered with vines that you could hardly land. You could hardly penetrate for a single foot. Progress is prevented by the rushes, the driftwood and the brush.

After this region is passed there is a belt of peculiar trees called Ambalbas, about the size of our ordinary forests of maple, poplar and small oaks, yet it is not noticeable only as a fringe to the neighboring frowning forest which towers up behind it. Vines fall down over the trees of smaller growth, covering them like a mantle, and in many places falling into the water. Back of that occurs the cane brake of various species of bamboo, three miles in width, and then you can reach the forest proper. Here ther are no such obstacles as you find in the mountains. The travel is not so difficult. There will be long stretches where we can thread our way with success, then we come again to the jungle where the tangle commences. Once there we have to force our way; cutting our way is not practicable, for every time you cut something else falls in your way. There is nothing to do but to place your shoulders against the mass and simply push your way through. Among this cane brake run several species of deer and a great number of tapirs, and it is the home of the prowling jaguar, which lies in wait for other animals, as does the alligator. Here, too, we are liable to encounter enormous anacondas. Once you get to an installment of the forest proper, instead of having bright butterflies and singing birds, you reach a region which is more like a region of death. The surface of the earth is covered, it is true, with vegetable growth, but it is at the summit of the trees 150 feet above us. If you could look on the surface of this forest it would be a mass of green, but you are below and it is like a subterranean region with only a dark twilight, and it is all silent as the grave. There is a damp earthly smell to the air, which is not penetrated by the rays of the sun. The trees are often as thick as in our own forests. We can only imagine what scientific treasures we could secure were this upper region accessible to us. After all, the region is richer in vegetable growth than the mountain region, but it is so far above us we can't see it.—[Wood Worker.

AN Italian engineer has completed the survey of a proposed canal across Italy, from near Castro, on the Tyrrhenian Sea, to Fano on the Adriatic. It will be 180 miles long if it is ever built, and will cost $100,000,000.

THE New Castle (Pa.) Wire Nail Company has sent to Germany for $80,000 worth of manufacturing material which cannot be had in this country.

MOISTURE IN IRON ORE.

Several iron importers have been engaged in a legal contest with the United States Government respecting the payment of duties on moisture in iron ore, or only on the ore itself. At Philadelphia, on the 12th inst., Judges McKennan and Butler, of the United States Circuit Court, took up the suits by John W. S. Earnshaw, an importer of that city, and by Sebastian B. Schlessinger, Clark L. Lehman, J. Mitchell Clark and Ludwig Dreier, of the iron house of Naylor & Co., of Boston and Philadelphia, against John Caldwalader, collector of customs. Mr. Earnshaw brings his suit to recover an alleged excess of custom duties amounting to $71.61 on three importations of iron ore. Naylor & Co. claim $371.61. The bill of complaint alleges that in importing say 1,000 tons of ore, the article will contain at least 10 per cent. of moisture, and if the ore is placed in open air where the sun can strike it, there will be a shrinkage from 1,000 tons to about 900 tons. It is urged that the 75 cents per ton duty can be collected only on the real importation, and not on the moisture.

Mr. Isaac Fegeley, president of the Warwick Iron Company, of Pottstown, was one of the several witnesses called by the plaintiffs, who testified that iron ore is bought and sold on a basis of being dried at 212°. William H. Thurston, president of the Bethlehem Iron Works, and who employs 3,000 men, testified that he had purchased iron ore since 1883, and dealers always, with one exception, treated the water, which was mechanically and not chemically, combined with the ore, as distinct and not a part of the ore, and trade was done on a basis of its being heated to 212°. At the close of the plaintiff's case, Assistant District Attorney Carr made a motion for a non-suit, on the ground that the meaning of the term iron ore had been determined by the Supreme Court as ore in the crude or natural state, and it is a question of law for the court to pass upon, and is without the province of a jury. The motion was overruled. The defense was then opened by Mr. Carr, who tried to show that the commercial designation of iron ore is ore in its natural or crude state. William D. Rees, of Cleveland, O., who is in a company who produce 225,000 tons yearly, testified to the same fact. Other witnesses for the defense were Joseph D. Weeks, David F. Houston, president of the Crozer Steel & Iron Works, R. F. Smith, James Pickands and Thomas Wilson.

Powell Stackhouse, vice-president of the Cambria Iron Company, said that the person had to take his chance as to the amount of moisture contained in the ores. In recent years, 1881 and 1882, allowance for moisture was made. The custom was in vogue in isolated cases before then, but did not become general until later years. Frank S. Witherbee, of Fort Henry, N. Y., who is with a firm second in the United States as a producer of iron ore, testified that the term iron ore means the ore with water both chemically and mechanically combined. If a pile of 900 tons was placed by a pile of 1,000 tons, and the smaller pile was made wet with rain, so that its weight increased to 1,000 tons, the intrinsic value of the two piles would be same as before, and they would both be ore, although the water does not increase the metal. Louis E. Stanton, of Crooker Bros., of New York, corroborated the testimony of the water witnesses. The remaining witnesses that were called were George H. Ely, president of the Western Iron Ore Association; William D. Marvel, J. Wesley Pullman, Robert C. Thomas and John M. Hartman. The interest in the suit was very much restricted by the court practically ruling out testimony which referred exclusively to domestic ores. The salient points of the case were presented in writing both by the defendant and the plaintiffs, and in the charge to the jury the court gave written affirmations or objections to these various points, and then addressed the jury upon the testimony. Without going into the detail of the charge of the court, or attempting to touch upon the various points made, it is fair to assert that the principal issue which the jury had to decide was whether sufficient evidence had been presented to prove that the custom, even in handling foreign ores, is to sell them as ore dried at 212° F., or whether this provision was not expressly stipulated in all or many of the contracts which were made for dry ore. While the Government might have strengthened its case in several points, it was in the main well conducted, and notwithstanding the fact that the ruling above mentioned interfered somewhat with the plan laid out it was evident early in the trial that the plaintiffs would not be able to sustain their claim. It was no surprise, therefore to find a verdict for the Government returned by the jury after they had been out for the hour which the court took for recess at noon.—[Iron Age.

THE LIGHT SHEET IRON INDUSTRY.

We understand that a project is on foot for the starting of a light sheet iron mill in Cleveland. Concerning the present condition of this particular industry, the *Iron Age* of October 18, says:

In some portions of the country, particularly in the West, a positive famine has been raging in light sheets. For weeks the demand has been so great that no stocks can be accumulated in the hands of the leading distributors at trade centers to meet the demands of the small consumers. Orders are booked in advance of receipts, which keep the stock moving from the receiving department to the shipping room. The mills are being pressed for deliveries in advance of dates agreed upon when contracts were made, but they so anticipated their entire output that they have allowed no margin for such a condition of affairs. The work they now have in hand will keep them busy much beyond the usual active season, while some manufacturers believe they will be able to run full time until next Summer.

Allusion has been made in our market reports to some of the causes of this activity in light sheets. One of the main reasons assigned, and probably the only one which has been far-reaching in its influence, is the rapid growth of the iron-roofing trade. While this branch of business has shown a steady advance for years past, it has made remarkable progress this season. Careful observers estimate the consumption of sheet iron for roofing, siding, ceilings, shutters, etc., in 1888 at fully 25 per cent. above that of 1887. Numerous establishments are working up 33⅓ per cent. more sheet iron this year than last, some have made gains of 50 per cent. and it is stated that one concern will probably reach 60 per cent. A large part of the increased use of iron roofing has taken place in the East, whereas, in previous years the West was peculiarly the home of iron roofers. This is explained by the growing favor with which iron roofing and siding are being received by owners of manufacturing establishments. Corrugated iron buildings are being erected instead of more expensive brick and stone structures. Increased room for warehousing goods is thus obtained at lower cost, and with fully as great protection from fires originating outside as though brick and stone were used. Sheds, stables, depot sheds, awnings for stores and a variety of other uses in the same line calling for light and strong roofing have stimulated the consumption of sheet iron most remarkably. More iron than ever before is going into shutters, doors and other methods of protection against fire, while sheet iron ceilings are steadily growing in favor for decorative purposes. The galvanized iron cornice-makers constitute in themselves an important subdivision of the roofing trade, and they consume an increasing portion of the output of the sheet mills.

So Called Indian Shell Mounds.

Mr. E. T. Dumple, writing in The Geological Bulletin of Texas, brings out a very interesting fact, and one which may shed some light upon the question of who were the builders of the shell mounds of the coast regions of Texas. During the great storm of 1886, which so nearly destroyed Sabine Pass, one of these shell mounds which was near a certain house on the river bank and the locality of which was exactly known, was destroyed or carried away by the violence of the waves and rebuilt nearly half a mile further up the stream than it formerly stood. It is, therefore, possible that these so called Indian shell mounds, which are composed almost entirely of shells, with fragments of pottery and sometimes a crumbling bone or two, were not built, as has been supposed, by Indian tribes who lived on shell fish, but are entirely due to the action of the water; and the presence of the Indian relics may be easily accounted for by remembering that these mounds are usually found in low ground, and, being high and dry, would naturally be selected as camping places by the Indians in their hunting and fishing expeditions.—Science.

Canal in Mexico.

At Villalerdo, Mexico, recently, work was begun on a canal to conduct water to Tlahuilalo. Several thousand men are employed, and 10 steam dredges are now en route from England. The length of the canal will be over 20 leagues, and it will be finished in six months. The canal will open up a rich cotton belt to the company constructing it.—[Industrial World.

A NEW EMPIRE IN THE NORTHWEST.

By the action of Congress and the national executive, most of the great Indian reservation in Northern Montana was thrown open to settlement, the Indian title having been peacefully extinguished. The newly acquired region extends from one hundred and four degrees three minutes to one hundred and fourteen degrees of west longitude, or from the eastern boundary of Montana to the main range of the Rocky Mountains. Its mean length, east and west, is about four hundred and forty miles, and its mean width eighty miles, the area being about thirty-five thousand square miles, or over nineteen million acres. A tract embracing about two hundred and eighty square miles lying around the the Poplar River agency, and another of much less area between the Little Rockies and Milk River, are excepted from the purchase and still reserved. This leaves an area of about seventeen million acres open to settlement. The work of surveying it is going forward as rapidly as practicable, but it will take about two years to fully complete and file the survey and maps. Meantime a steady influx of settlers has already begun, who will acquire what is known as "squatters' rights." if they settle in good faith on the land. These "rights" will give each man an option of ninety days within which to file a claim when the land comes into the market. According to the terms of the Act of Congress, no land can be acquired on the newly opened tract save by pre-emption or homestead. Thus, no individual can obtain more than three hundred and twenty acres.

The Territory was recently visited by the writer of this article, and so far as could be judged from a somewhat cursory view, it seemed to fully justify most that has been spoken and written in its favor by explorers, from Lewis and Clark in 1804 to more recent ones. It is in the main a plateau or "bench land," lying north of the Missouri, and well watered by that river and its tributaries. The famed Milk River Valley extends for about three hundred miles through the very heart of the region. This valley is intersected at frequent intervals by tributaries of the Milk River. The soil is a deep black loam, resting on a clay subsoil. A luxuriant growth of grass clothes the gently rolling country, broken only by the frequent belts of timber which line the streams. Wherever the primitive sod has been broken, as at the various military posts, wheat, oats, barley, potatoes, and all garden vegetables grow well. The climate is milder, and the mean temperature considerably higher, at least in the western portion, than in corresponding latitudes further east. This is caused by the Chinook winds, which reach the region from the Pacific, warmed, as they are, by the Japan current. The climate is far from equable, however, a shift in the direction of the wind causing a change of many degrees of temperature in a very few hours. The rainfall is much more abundant in the southern and settled portions of Montanna. In 1887 and the present year the precipitation was ample for all purposes of successful agriculture. The St. Paul, Minneapolis & Manitoba railroad traverses three-fourths the length of the region, about midway between its northern and southern boundaries.

To sum up, here is a virgin tract nearly as large as the entire State of Indiana, covered with nutritious grasses, fairly well provided with water and timber, with a soil in the valleys which seems well adapted to producing the small grains, while the higher and more broken portions are fitted for grazing; with the climate of high northern latitudes somewhat tempered by the mild winds from the Pacific; a large portion of it traversed by a great railroad line.—[Western World.

Strength of Ropes.

A test of the average tensile strength of ropes was recently made in Paris, with the following result; the length of specimens for testing was 13 feet:

	Lbs. per sq. inch.
White hemp	10,500 to 11,200
Tarred hemp	7,700 to 8,400
White manilla	9,800 to 10,600
White aloes	5,600 to 7,700
Flat, tarred hemp or manilla	7,800 to 8,400

A rope of unannealed wire has an ultimate tensile strength of about 55,000 pounds per square inch of section of metal; when annealed the ultimate strength is reduced to about 45,000 pounds, but the elongation is nearly doubled, being 12 to 16 per cent. in annealed wire. The best wire ropes for mining purposes have a much higher tensile strength. The tensile strength of a wet rope is only one-third that of the same rope when dry, and a rope saturated with soap or grease is still weaker.—[Ohio Valley Manufacturer.

CONDITIONS GOVERNING THE PRODUCTION OF DIFFERENT GRADES OF PIG IRON.*

The grade of iron is dependent upon the following conditions :

First. Upon the chemical composition of the individual ores. A high manganese pig cannot be produced from an ore low in manganese, or a low phosphorous pig from phosphoric ores.

Second. Upon the chemical composition of the whole mixture. Reduction of manganese is facilitated by a strongly basic condition of the slag-forming constituents of the mixture; sulphur is eliminated by a strongly basic slag. Moreover, the melting point of the slag produced depends upon its chemical composition.

In general, the greater the amount of elements more difficult to reduce than iron (silicon, manganese, etc.,) it is desired to reduce and cause to alloy with the iron, the higher the melting point of the slag must be.

Third. Upon the mineralogical condition of the constituents of the mixture. The temperature of formation of the slag is more important than the melting point with regard to the grade of iron produced, and depends upon the amount of silica in the slag, and the condition in which the slag-forming constituents exist. The different reducibility of different ores also must be taken into consideration. In smelting difficultly-reducible ores, more iron is slagged off than when smelting easily reducible ones. It is also harder, in the first case, to produce iron high in silicon, carbon or manga-

Fourth. Upon the temperature of the melting zone of the furnace. The reduction of manganese and silicon in large quantity requires high temperatures, so that high silicon or manganese pig cannot be produced in a furnace working cold. The temperature of the furnace depends upon the temperature of the blast, the nature of the fuel, the proportion between fuel and ore, and the heat consumption of the furnace. The latter is greater when large amounts of manganese and silicon are reduced, and when smelting difficulty-reducible ores, than in the reverse case. All these conditions together, cause a larger fuel consumption and the employment of a more highly heated blast, the higher in silicon or manganese the pig is desired to be.

Fifth. Upon the quantity of blast which the furnace receives in unit of time, or more correctly, upon the proportion this amount of air bears to the cubic capacity of the furnace. The more air a furnace receives the quicker the smelting proceeds and the greater the quantity of iron produced, but the more easily unreduced iron may be slagged off, and the less the amount of silicon and manganese reduced. Therefore, a furnace making white iron requires closer watching than when making grey iron or high manganese iron. By the proper mixing of several ores, or by mixing the same with suitable flux, different grades of iron may be produced from the same ores, even when the original condition of the ores appears to be more suitable for one purpose than the other. Bog ores, intimately mixed with quartz or quartzy red hematite ores, nearly always promote the production of grey iron; on the other hand, high manganese spathic ores when used to produce grey iron, have a tendency to make the iron white if cooled suddenly, and this effect is still more marked if white iron or spiegel is produced, a large amount of alumina in the ore makes it more suitable for making grey than white iron, because it raises the temperature of formation and melting point of the slag. Conversely the production of grey iron is more difficult if ores low in alumina are used.

It is self-evident that in the production of a specified iron, no ore should be used from which elements detrimental to the employment for which the iron was intended might be introduced. The employment of spiegel generally requires freedom from phosphorus; this is also the case with grey pig for Bessemer use. It would be absurd to smelt phosphoric ores for this purpose. The amount of phosphorus is of small importance in foundry or ordinary white iron, the basic, Bessemer or Thomas process requires a high phosphorous pig; for this purpose phosphoric ores are employed. A large amount of manganese is detrimental to foundry iron, as it has a tendency to make it slightly harder and whiter. For making white iron it is more advantageous than detrimental. High phosphorous manganiferous ores are more suitable for the manufacture of white iron, while low manganese ores may be employed for both purposes, but are better adapted, especially if high in alumina, for grey than for white iron.

The purpose for which the ore is used must depend upon the above considerations, according to its nature.

Independent of the size of the furnace, the character of pig iron produced has a very marked influence upon the daily output.

The output of a given furnace being greatest when running on white (or high) irons, the production, when different grades of iron are made, has been found to be about as follows :

White (or high) pig iron	100 tons.
Grey (or foundry) pig iron	65 "
Spiegeleisen (10 to 12 per cent. manganese)	60 "
Spiegeleisen (high manganese)	40 "
Ferro manganese (60 per cent. manganese)	25 "

*Translated for the "Journal of the United States Association of Charcoal Iron Workers," from "Leoebur's Handbuch der Eisenhuttenkunde," Vol. II, p. 521, by Edward K. Landis.

THE CHAPPELL DRILL CHUCK.

A personal inspection of the drill chuck herewith illustrated, shows it to be admirably adapted to the end in view, and in every way a serviceable tool. Referring to Fig. 2, showing the various parts, the largest piece shown is the cast iron shell or body of the chuck, into which the worm gear (shown at right of shell) fits nicely. The jaws are placed in their slots in center piece, and this is placed inside the worm gear and shell, fitting both parts well, and is thus held firmly in place by a taper pin passing through both center piece and shell. The worm (shown at lower left-hand corner) is then screwed into the opening shown in shell, thereby meshing with the worm gear, a left-hand screw is put in end of worm to hold it in position when reversing the motion, and the chuck is assembled, save the steel cap with the small screws shown in the cut. The extreme

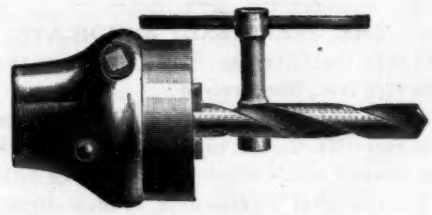


FIG. 1.

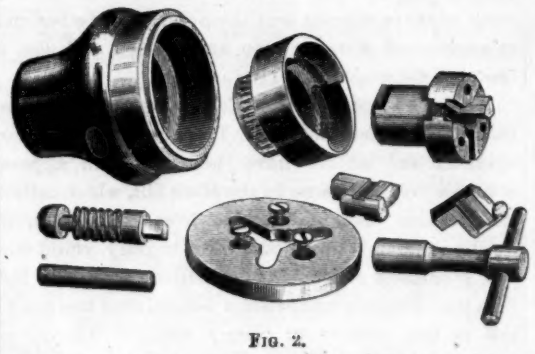


FIG. 2.

length of the chuck and jaws is 2¾ inches; largest diameter 2⅝; weight about 2½ pounds.

The following claims are made for this chuck :

First. Its application of power by the worm and gear, in the upper end of which are cut the cams, which move the jaws both in and out give, we believe, the most powerful gripping chuck in the market.

Second. Its wearing surfaces being large (jaws having a bearing 9-16 inch long and 5-16-inch wide on the cams) give a chuck that runs as near perfection as can be arrived at by adjustable jaws.

Third. The large bearings prevent the jaws in this chuck from tipping up at outer end, as many chucks do after using a short time, which have only a short bearing at base.

Fourth. That its lasting qualities are second to none because of its first-class workmanship; in addition to large bearings, is proved by the fact that one of the first of this style chucks made, was made with a bronze or gun metal worm and cams four years since, and is in good condition to-day, having been in constant daily use during this time.

Fifth. It is well made in every way; the manufacturer having an experience of over 20 years in making one of the best lines of chucks made in Connecticut. All parts are of steel but outer shell, which is of fine grade cast iron, jaws and worm of cast steel hardened, and jaws ground out in center to secure accuracy in holding work.

Sixth. It is practically a dirt-proof chuck. The parts being covered by a steel cap which prevents shell from breaking open, and at the same time secures the parts from chips or dirt.

Seventh. The jaws cannot be run out of the chuck by an inexperienced workman while using it, and no matter what position the jaws are in, there are no sharp angles or projections to cut the hands or tear the clothes of the operator. Merwin A. Bartlett, Canton, O., is the sole agent for Ohio.

BRITISH VIEWS OF AMERICAN BESSEMER PRACTICE.

Bessemer steel manufacturers in the United Kingdom "have long been astonished and puzzled by the extraordinary output of the Bessemer works of the United States. Not merely in respect of the number of blows," says the London *Ironmonger*, "but also as regards the tonnage per week or month the American makers of Bessemer steel appear to be far ahead of us—so far, indeed, that our manufacturers are very curious, not to say anxious, to know 'how it is done.' In Great Britain the practice pursued in producing Bessemer steel is fairly uniform, and it is generally conceded that considerable expedition characterizes the work from beginning to end. Yet, with all our skill and knowledge, we are admittedly behind the American makers to a very marked extent. They seem to get more steel in a week out of seven-ton converters than we do from ten-ton converters. A remark made at last week's meeting of the Iron and Steel Institute by Captain Jones, of the Edgar Thomson Steel Works, may, perhaps, aid in elucidating the mystery. Captain Jones said that proper care had not been taken in the manufacture of certain American steel for bridges, and he 'let the cat out of the bag, by stating that the 'blow' was probably performed in not more than eight minutes, and the ferro-maganese put in cold. If that period represents anything like the general length of time given to the 'blow' in the United States, we need wonder no longer that so many heats per shift are got out in the Bessemer works there. A shortening of the blowing time by from 80 to 100 per cent. must mean a good deal in a week's work, and the fact goes a long way in helping us to understand the enormous outputs of the American works. It is an entirely different question as to whether the steel thus produced is what it ought to be. If Captain Jones is correctly informed—and so able a gentleman certainly is in a position to know whereof he speaks—it is obvious that a good deal of the American Bessemer material must be of very poor quality. The very short blow is likely to render that result moderately certain, but to put in the ferro-manganese cold is quite sufficient to make the product anything but steel. In saying this we do not seek to attach general discredit to American Bessemer steel, but desire simply to show that where really good and well-made steel is to be turned out it is not possible to make it in substantially less time or in much larger quantities than is done by our own works. This is true of ordinary rail steel, and is necessarily even more emphatic in relation to steel containing specified percentages of carbon for purposes other than rail-making."

Another Standard Gauge Road to the Ohio River.

The month of November will probably see the last of another narrow gauge road, as it is then proposed to change the gauge on the Connotton Valley R. R. The new steel is being laid outside of the narrow gauge track on standard ties, so that the final work in changing will be light. The Brooks Locomotive works of Dunkirk, N. Y., supply the new locomotives, all of the latest and best designs. The Pullman Car Co. are building the new passenger coaches. They will have the Martin steam heaters, steam being taken from the locomotive. Four hundred new coal cars are being made by Pennock Bros., of Minerva, Ohio. The road has now in operation 138 miles of road. They are building a branch from South Solon to Chagrin Falls, and opening up one of the finest sections of stone quarry lands in the State. It is proposed to run through trains from Chagrin Falls to Cleveland, which will be a great convenience to local travel. They are also building an extension of 30 miles from Coshocton to Zanesville. As a narrow gauge road, the Connotton road has been isolated, and debarred from any profitable interchange of business, as a standard gauge, the whole situation is changed. It becomes a feeder to other roads, and, in turn, is fed by them.

Reaching important coal fields, it opens up great additional facilities for a large development of them, by reason of a much wider market afforded. Through the extension of the Lake Erie & Wheeling, and the Cleveland, Lorain & Wheeling railroads, another line will be opened to Wheeling, and the Ohio River.

We are indebted to Mr. Albert Rokusek, General Freight and Passenger Agent, for the information of the plans of the company.

THE
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IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS.

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THE ETHICS OF FREE TRADE.

There is not a foreign English trade journal comes to us that does not bear witness to the struggles of workmen for better recognition—their urgent demands for a larger compensation, and strikes and notices of strikes. An advance is agreed to in some cases, but refused in most. Unrest and disquiet seem to pervade all classes of English workmen, and on all hands it is tacitly allowed that their condition is not a satisfactory one.

Is there any hope for the English workmen? Are there any causes at work which tend to better his condition in the near future?

The recent meeting of the Trades Union Congress, in England, and some of the utterances of its President occasions a lengthy editorial in the *Ironmongery* of September 15, from which we shall make extracts. It says:

> We freely admit that in past years there may not have been on the part of capitalists, considered as a whole, that regard for the material welfare of labor which abstract ethics would exact; but is it probable that if the relations of employer and employed had been reversed, the position would not have been improved.

This seems to us to be of the feeblest sort of reasoning. The capitalist has no right to think what might have happened, had things been reversed. His course should be a plain and straightforward one, to endeavor to look after the interests of those who labor for him as carefully as he looks after his own. Such action would soon convince workmen that capital and labor was not antagonistic:

> The President of the Congress, amongst other "highfalutin" expressions says: "Economic forces are working against humanitarianism" This appears to us as a mere piece of rhodomontade, of the meaning of which the speaker had no very clear conception, or otherwise it is a distinct attempt to set classes by the ears. The question of humanitarianism has but little to do with economic principles, and if the associated Unions intend to give battle to the latter they must inevitably suffer absolute defeat. As a mere principle of political economy labor possesses only the value which the demand for it insures, and that value rises and falls as the demand for it increases and lessens. It is, therefore, neither judicious nor fair to enunciate a sweeping condemnation of capitalists—past, present, and to come—because they have been guided and will be guided in the conduct of their enterprises by economic principles.

Above is the admission that labor has not been treated as well as might have been, but capital must not be blamed, for economic principles wouldn't let them do otherwise. Humanity, a principle coeval with man's creation, must not be considered as against economic principles, evolved by man, and established as rules to guide the intercourse of communities, according to the views of the originators.

The President congratulated Congress upon the fact, that much had been done to decrease the hours of labor and enhance wages, and that further advances in this direction must be made. To this the editor replies:

> Does he know whither he is drifting? or is he unable to appreciate the logical issue to which that programme, if accomplished, will conduct him? It must be said that during the period under his review, Great Britain was at the zenith of her manufacturing prosperity, and the practical absence of competition rendered it a comparatively simple matter to adjust the fair classes of labor. But the circumstances have entirely changed. We have now powerful competitors, whose ability to compete arises mainly from long hours of labor, and the low rate of wages which obtains. It must be obvious to any man who will take the trouble to think that to increase permanently the cost of iron, manufactures would be to intensify that competition a hundred fold, and if pursued to a sufficient length, that such a policy would entirely destroy our manufacturing interest. * * * * *
>
> The great question is, are we to retain what trade we have, or are we to embark upon a policy which would inevitably intensify the competition from which our capitalists, no less than our laboring classes, are suffering, and which, if pursued to the bitter end, will leave neither profit for the former nor employment for the latter.

It follows, from all this, that the outlook for the British workman is gloomy in the extreme—that he must be content with the hours he now works and the wages which he now receives—that English industries are confronted with a competition so formidable, as to be seriously felt now, and a standing menace to the future, and that British workmen must not raise their voices in their own behalf, but silently "grin and bear it." Now Free Trade may be economically right, and Protection economically wrong, but one fact is beyond dispute, that the condition of the workingmen in the United States is infinitely better than that of the workmen of Great Britain, and while one country does not recognize "humanitarianism" in business, the other does. It is sometimes much safer to hang on to what is, than to what ought to be, in other words, "the frying-pan is better than the fire."

E. C. P.

THE GREAT SALT SYNDICATE.

We copy the following from *Ironmongery* (England) of the 13th inst., just received:

"The fiat is issued. The great salt syndicate is an actual fact—Mr. Corbett has been won over, and salt is to be *advanced about* 100 *per cent.* The poor folks in the salt business want amelioration of their circumstances quite as urgently as chain makers and nailers, and a small advance will not hurt the public, will be beneficial to numbers of working men and women, and *last, not least, pay the syndicate.*" (Italics ours).

We don't know who Mr. Corbett is, but we do know that a lot of feebling Free Trade or Tariff Reform speakers and editors have been going in apparent ecstasies over the clause in the Mills bill, which relieved the working man and farmer from taxed salt, and howling that only in a protected country could trusts and syndicates exist. They wilfully ignore the facts, first, that domestic competition has reduced the price of salt in this country to merely nominal figures, and secondly, that Free Trade England is as prolific, if not more so, in "trusts" than Protective America.

SHUTTING THE STABLE DOOR AFTER THE PONY IS GONE.

The past has been prolific in instances of this easy but useless operation, and Cleveland is the scene of the latest performance. Years ago, the citizens had indirect but almost positive knowledge, that owing to the absolute control possessed by a single officer over the city's funds, reaching as they have done, by reason of the city's unexampled growth, to enormous sums, a reckless or dishonest official might plunge the municipality into serious temporary embarrassment, and possibly loss. Instead of promptly recognizing the exigency of the case, and taking immediate steps to provide proper control and checks, year by year glided by in fancied security. At last, the sound business sense of a few men, demanded new methods of doing the city's business, and succeeded in securing the passage of a law covering the situation—this was to take effect on the 15th of October inst. But when the time came, the stable door was wide open, and the pony securely ambling amid Canadian or foreign scenes.

It is hardly probable that the city will eventually lose anything, owing to the large bond, $500,000, and the undoubted financial ability of the bondsmen to meet all proper demands upon them—but that is neither here nor there. No opportunity for embezzlement should ever have been afforded. No single man should ever have had the power to personally control such vast sums; no matter how upright his character, how established his moral and business position, or how wealthy he may be reputed, the funds passing into his hands form a great public trust, in which the whole community is interested, and to protect which no safeguards should be wanting.

There seems to be a sort of hideous but alluring glamour around public funds, that oftentimes leads into false and deadly paths those who would be least suspected of any weakness.

The fatal temptation is presented of a temporary use, with early repayment, but frequent and renewed abstraction takes the place of repayment, until the only alternative of the unhappy one, is flight or death, or prison. As far as public funds are concerned, no such temptation should be possible. It may be argued that absolute safety is unattainable, as even with abundant checks, collusion among several may result in the same way—while this is possible it is not probable. The new law governing the management of the city funds seems to be carefully drawn and fairly ample, and after the confusion and annoyance and public shock of the present disaster have passed away, such a contingency in the future would seem to be impossible.

"THE SURVIVAL OF THE FITTEST."

BOSTON, Oct. 22.—The Norway Steel & Iron Company, with extensive works on Dorchester avenue, South Boston, has decided to wind up its affairs, close up its works, and go out of business altogether. Fully five hundred men will be thrown out of work. The business of the company consists of rolling iron, steel, boiler plates, etc. The concern is particularly well known throughout the centre of the country, because of its dealings in Swedish iron.

Albert Geiger, the treasurer of the company, said to-day that the contemplated liquidation has been forced by a long recognized and an unsurmountable inability to compete with Western iron companies, such as those in Pittsburgh, where their close proximity to both the iron and coal mines, gives them an enormous financial advantage over the Eastern companies, which have to pay freight rates on both coal and iron, aggregating large sums. The tariff of about 45 per cent. on raw iron is another reason which has led the company to take the step noted. Mr. Geiger expressed the opinion that if iron—the raw material—could be imported free of duty, the company would be able, despite the competition with Pennsylvania, to continue its business successfully.

We are sorry for the Norway Iron Company, and for those other mills and furnaces, that before long must follow their example. Vast stores of iron and fuel that were unknown or inaccessible when the Norway works were started, are now, through the exampled development of the country, in the midst of, or alongside of flourishing, laboring, consuming and producing communities, who necessarily wage a friendly but deadly commercial warfare upon less-favored sections. The competition that comes by reason of free trading in the United States, is reducing, and necessarily must gradually reduce the price of all manufactured articles, and those who can make the cheapest will stay, the rest must go. The Treasurer says that if the duty could be taken off of his *raw material*—pig iron, they could continue to run, despite Western competition. While we are sorry that 500 men should be thrown out of employment by the closing of these works, we are glad enough that the thousands and tens of thousands of hardy men, who dig the ores and coal, and turn the coal into coke and transport the same by rail and vessels, and make it into Mr. Geiger's *raw material*, have the chance of doing all this work in this country, rather than England should have the opportunity of supplying us. It is a fundamental rule that the many must be protected, even if a few suffer, and the makers of over 6,000,000 tons of pig iron must be looked after, rather than a few hundreds or thousands who work it up. As far as the people are concerned, the shutting up of one or even many establishments, makes no difference. The low cost of transportation enables the finished makes of works far away, to be sent everywhere. Generally, prosperous conditions obtain, and the men who are now discharged will have no difficult in earning a livelihood elsewhere in this favored country. The capital invested will necessarily suffer in the closing up, but this is one of the contingencies of business life, and the wise meet promptly what must come sooner or later.

E. C. P.

THE experiments with melinite shells against the *Resistance* are reported to have shown that those projectiles are unable to penetrate armor of over 2 in. or 3 in. thickness.

YEARLY SHOWING OF BRITISH IRON AND STEEL TRADE.

The report of Mr. J. S. Jeans, Secretary of the British Iron Trade Association, showing the production of pig iron and stock on hands, and the production of Bessemer and open-hearth steels, is at hand. The make of pig iron for three consecutive half years was as follows, in gross tons:

Six months to June 30, 1888.	Six months to Dec. 31, 1887.	Six months to June 30, 1887.
3,902,304	3,773,312	3,668,115

	Tons.
Increase over previous six months	128,992
Increase over same period in 1887	234,689

Of the make during the first half of this year, 1,549,265 tons was hematite pig; 1,958,319 tons was forge and foundry pig; 153,053 tons was spiegel and ferro-manganese, and 242,185 tons was basic pig.

The stock on hand was 2,673,860 tons, against 2,616,366 tons at the end of 1887, or an increase in stored pig iron of 57,494 tons; showing an increased consumption and exportation of 71,498 tons. The increase of consumption in the United Kingdom for 1887, was 585,739 tons.

The production of Bessemer steel ingots, for three consecutive half years, was as follows, in gross tons:

Six months to June 30, 1888.	Six months to Dec. 31, 1887.	Six months to June 30, 1887.
1,051,481	1,148,849	915,554

	Tons.
Decrease from previous six months	97,368
Increase over same period in 1887	135,927

The production of Bessemer steel rails was:

Six months from June 30, 1888.	Six months to Dec. 30, 1887.	Six months to June 30, 1887.
487,174	576,062	445,785

	Tons.
Decrease from previous six months	88,888
Increase over same period in 1887	41,389

Over 53 per cent. of the Bessemer steel ingots were disposed of as follows:

	Tons.
Plates, fish plates and angles	32,609
Bars, tees and forgings	104,759
Blooms and billets	170,711
Sleepers	46,961
Castings	2,234

The production of open-hearth steel was:

Six months to June 30, 1888.	Six months to Dec. 31, 1887.	Six months to June 30, 1887.
616,421	575,714	405,390

	Tons.
Increase over previous six months	40,707
Increase over same period in 1887	211,031

The steel produced was used as follows:

	Tons.
Plates and angles	247,212
Bars, tees and forgings	71,171
Blooms and billets	12,551
Castings	8,634
Rails	7,950

The decided advance in the stocks of pig iron on hand is noticeable. Taking Mr. Jean's figures for the consumption of pig iron in 1887, 7,317,067 tons, the stock now on hand amounts to over 36½ per cent. of the annual British consumption, or, in other words, to a supply sufficient for 19 weeks, and must represent a locked-up capital of some $27,000,000. This stock, which first commenced to attract attention in 1882, when it amounted to 18.2 per cent. of the year's consumption, reached 37 per cent. in 1886, and fell to 36 per cent. last year.

The production of both Bessemer ingots and rails, shows the effect of the loss of market in this country, through the reduced railroad mileage under construction.

The increase in production of open-hearth steel, depending as it does, so largely on ship-building, must be thoroughly satisfactory to the English iron masters, as it, to possibly a greater extent than any other British product, gives three profits, viz., the profit of production, the profit of ship building, and the profit of ship owning. —[Railroad Gazette.

A NEW SOURCE OF COKE SUPPLY TO CLEVELAND.

Although the coke made on the line of the Rochester & Pittsburgh road has been well known in other places, it is only recently that an effort has been made to introduce it in Cleveland.

The Rochester & Pittsburgh Coal & Iron Company, have their headquarters and mines at Walston, Jefferson County, Pennsylvania. They control from 17 to 20,000 acres of coal lands, and are both large shippers of coal and coke makers.

The Lower Freeport, which, in many localities, is worthless, here thickens up into a splendid seam, giving not less than 6 feet of clean coal. The capacity of the mines at Walston and Adrian, is about 7,000 tons a day.

There are 700 ovens at Walston, and 450 at Adrian. A particularly favorable feature about this coal is that the lump is a favorite commercial coal, and the small, which ordinarily sells for little or nothing, commands a good price as coke.

The following analysis, made by McCreath, comes to us with the assurance that it is an average sample of the coke as shipped:

Water	.054
Volatile matter	.543
Fixed carbon	90.868
Sulphur	1.044
Ash	7.516
	100.030
Phosphorus	.008

This shows decidedly better that the average Connellsville and foundries using it state that it is perfectly satisfactory. The development of this new field is particularly satisfactory, inasmuch as it offers a thoroughly good article, and in event of a strike at any time in the Connellsville field, a source of supply to those using Connellsville coke. Its proximity to Buffalo, only 184 miles, ought to stimulate the use of it, and the development of iron and steel industries at that point. It reaches Cleveland by way of Salamanco and the N. Y., P. & O.

The Minnesota Iron Range.

The character of Vermilion ore is already widely known as the highest and best on the continent; and the immense deposits of it make the region the richest iron country in the world, and its development into the leading range of the country will come in two or three years, says the *Pioneer Press*. Years ago, George C. Stone, the organizer of the Minnesota Iron Company, became interested in the region, but it was not until 1883 that his efforts bore fruit. That year the Duluth & Iron Range railroad was started and the next year the first ore shipments were made. Since that time there has been a steady increase in the output, and next year it will be more than doubled. Shipments by years from the range were as follows:

	Tons.		Tons.
1887	390,467	1885	225,484
1886	305,954	1884	62,124

The Minnesota mine is the largest producer in the Lake Superior region. Next year the work of the range will be much greater. The Minnesota company is preparing to ship 600,000 tons, and the Pioneer, Zenith, Chandler and two or three other new mines will make their first shipments. The total output of the range for 1888 is estimated as high as 500,000 tons, but it depends largely upon the state of the iron market, and the rapidity of the work of putting new mines in shape for business, as well as upon the railroad facilities furnished. The Duluth & Iron Range is now completed nearly thirty miles east from Tower, which will make accessible many of the best locations. The same road will be further extended in the near future. It is owned by the same men as is the Minnesota Iron Company, and its growth will not only keep pace with the growth of the range, but will precede and render possible much of the development.

The World's Silk Production.

The total world's production of raw silk in 1887, according to statistics recently published at Lyons, France, was 11,710,000 kilos, equal to about 25.762,000 pounds, against 23,386,000 pounds in 1886, 20,497,400 pounds in 1885, and 21,837,200 pounds in 1884. The detailed production in kilos of 2 1-5 pounds, by countries, is given in the following table:

	1884, kilos.	1885, kilos.	1886, kilos.	1887, kilos.
France and Spain	568,000	591,000	729,000	800,000
Italy and Austria	2,952,000	2,625,000	3,405,000	3,750,000
Total for Europe	3,520,000	3,216,000	4,134,000	4,550,000
Levant	730,000	623,000	677,000	730,000
Exports from—				
Shanghai	2,695,000	2,631,000	2,444,000	2,450,000
Canton	774,000	715,000	1,110,000	1,080,000
Yokohama	1,346,000	1,372,000	1,484,000	2,100,000
Calcutta	861,000	760,000	781,000	800,000
Total for Eastern Asia	5,676,000	5,478,000	5,819,000	6,430,000
Total production	9,926,000	9,317,000	10,630,000	11,710,000

—[Bradstreets.

Glue for Damp Places.

For a strong glue, which will hold in a damp place, the following recipe works well: Take of the best and strongest glue enough to make a pint when melted. Soak this until soft. Pour off the water as in ordinary glue-making, and add a little water if the glue is likely to be too thick. When melted, add three table-spoonfuls of boiled linseed oil. Stir frequently and keep up the heat till the oil disappears, which may take the whole day and perhaps more. If necessary, add water to make up for that lost by evaporation. When no more oil is seen, a table-spoonful of whiting is added and thoroughly incorporated with the glue.—[Carpenter and Builder.

ANOTHER RAILROAD BRIDGE OVER THE OHIO RIVER.

Advices from Wheeling seemed to indicate that the building of a new double track, Union Railway Bridge is now assured, and that the work will commence forthwith. It will be located at the upper end of Wheeling, and connect that city with Martin's Ferry, on the Ohio side. The bridge will be about 2,000 feet long, and 90 feet above low water. For the accomodation of the general public, foot-walks are provided on either side. The completion of this bridge, is a matter of large interest to several existing Ohio railways, and others now building. The only railroad bridge heretofore at, or near Wheeling is that owned exclusively by the Baltimore & Ohio, at Bellaire, several miles below the City of Wheeling, proper. The only unbroken rail connection between Cleveland and Wheeling, in the past, controlled by one concern, was via the Pennsylvania Company's lines, and the Steubenville bridge. The Cleveland, Lorain & Wheeling Railway, for many years past, has transferred the cars to barges, and ferried across the river to the various industries lining the banks of the Ohio.

The Wheeling & Lake Erie is rapidly pushing its extension from Bowerstown to Wheeling, giving, when finished, a direct connection with Toledo, and the Northwest. It is stated that the South Pennsylvania & Ohio Railway has a thousand men at work on the line from Canton to Martin's Ferry, and President Blood asserts that the road will be completed by the time the bridge is. This road is to be a Union road, open to all other roads which may want to use its tracks, and cross the bridge. The Valley Road, connecting either with the S. P. & O., or the W. & L E., will furnish another unbroken line from Cleveland to Wheeling. The Cleveland, Youngstown & Pittsburgh, running into Fairport, will connect with the S. P. & O., at Bergholtz. These competing lines, ought to greatly stimulate business. Wheeling will then have direct communication with four great ore-receiving ports, Toledo, Lorain, Cleveland and Fairport.

It is pretty well settled that a road will be built from Wheeling to the coke fields, the distance over a good line being only 70 miles to Uniontown or Connellsville. The chances are largely in favor of the completion of the South Pennsylvania scheme, and a connection with this will give a new direct short line to the seaboard. From what has been said, it will be seen how important the building of this new bridge is, and how many large interests will be affected by it. It ought to be opened in 1890.

What They Hope For in England.

The following article, from the *London Implement and Machinery Review*, gives a good idea of the interest with which the Presidential contest in this country is viewed across the water:

"There is no manufacturing center in the United Kingdom that is more intently watching the course of political events in the United States, than Sheffield. This strained attention is kept up in spite of the circumstance that President Cleveland's fiscal programme would leave a tolerably heavy duty upon such goods as Sheffield would like to send into the American market. The thing is explained, however, by the Sheffield manufacturers' belief, that any relaxation of the prohibitory duties levied upon British exports to the States, would be of substantial benefit to their industries. A recent case aptly illustrates the grounds for this anticipation. A Sheffield firm, largely engaged in the manufacture of sheep shears, has an American customer who ventured to protest against the high duties levied upon the shears consigned to him. Perhaps, remembering the railway porter who argued that a tortoise was 'a hinsect,' he contended with considerable force that the shears in question were large scissors, and should be taxed as scissors. His contention was sustained, and the result was a substantial decrease of the duty. The business which the Sheffield firm did with America was immediately increased by one-third, and we have reason to believe that the increase is fully sustained. Sheffield argues from this instance, and from others, that the difference between the quality and the cost of her goods and the quality and the cost of the American goods is such that a very slight reduction in the duties which at present restrict their American sale, would enable Sheffield to successfully compete with the United States makers."

MEXICAN coal has been successfully used for making coke at Pittsburgh.

EXPERIENCED FOUNDRYMEN ON MELTING IRON.

BY ROBERT E. MASTERS.

Any one who is about to purchase a foundry cupola, after reading the gilt edge representations in the different circulars and catalogues they receive, is liable to become thoroughly confused about which style to select.

Each of them is represented to do more than any or all the kinds that have ever been operated. On account of some peculiarity in their construction, one is made to believe they cause the wind to do a contortion act or go through some performance that "melts the iron more rapidly than any cupola" that has ever been introduced, and each one of them will "produce a hotter and more fluid iron of uniform strength all through the heat" than can possibly be obtained from any other, and no matter which one is selected, we are told it will effect a saving in fuel of from 25 to 40, and even as high as 50 per cent. over any other cupola that has been offered on the market. And so the Arabian Nights' stories go on, followed by a lot of references and records of wonderful results obtained until the unsophisticated foundryman concludes, by the introduction of one of the cupolas, he will require little else than wind to melt his iron.

Foundry foremen have told me that the publishing of such phenomenal results in melting iron as occasionally appear in circulars and mechanical journals has injured them in the estimation of the firm who employed them. For instance, a superintendent who is not a practical foundryman, and therefore does not know that the most advantageous conditions must exist in a cupola, blast fuel and iron to produce the best results, reads an account of high figures obtained in melting by some one who is ambitious to have his name attached to a performance that is to surpass all previous records. The superintendent does not stop to consider anything about the size of the cupola, or whether it is a 7,000 or a 70,000 pound heat, but he goes to the foreman of the foundry and points out the economy of melting at the figures contained in the account. Occasionally a foreman who has not the courage to stand up for what he knows to be right, and is afraid he will be considered incompetent, makes the coke weigh light and the iron weigh heavy in what he calls a trial heat, and presents a report that satisfies the superintendent, and another magical melting act goes on record.

During the past fifteen years, the writer has traveled considerably, and while investigating this question, has operated cupolas of various types from 18 in. to 72 in. inside diameter. I have, in a plain 38 in. cupola, where everything was in right proportion and worked in harmony, melted ten pounds of iron to one of fuel, in a heat of 24,000 pounds, and the metal was fluid enough to run light castings clean and solid, but I do not pretend that these figures are a basis for any one else to work on, for I have then gone in a foundry where they had the most approved and improved type of cupola, and could not melt 7½ to 1, and call the iron melted if the fate of the nation depended on the result. I have never been able to reach the extraordinary high figures claimed by some men. My experience in actual practice has been on an average of 7 to 1, and in the exercise of strict economy, it has often been less than that figure; much depends on the class of iron melted, and the quality of work to be poured with the fluid iron.

I have frequently called at foundries where these monumental reports originate, in hopes I could see Aladdin with his wonderful lamp operating the cupola; but the days I called on the different foundrymen claiming to melt with such a low percentage of fuel, there was always some reason why the lamp could not be rubbed up to its proper brilliancy to make the genii appear and produce the results published. If space allowed, I could tell some very amusing stories of how some of these reports are made up.

Mr. W. W. Snow, manager of the Ramapo Car Wheel Works, who, I believe, has had as much iron melted as any man in the United States, tells me that 7 to 7½ pounds of iron to one of fuel gives him better results than a higher ratio in producing good, solid, clean castings, even in large heats. From conversations and correspondence, I have had with a large number of other prominent foundrymen, I select the following letters on this subject from gentlemen who are well known as contributors to the technical press:

From Thomas D. West, author of "American Foundry Practice and Moulder's Text Book," Cleveland, O.:

"With reference to fuel and melting, I can only say that best of conditions must prevail, and the iron cannot be expected to successfully run light castings where 1 to 10 or less fuel is used in the cupolas now being generally used in the country.

"As for myself, I find no *economy* in trying to exceed 1 to 7½. To express what I mean by *economy* would fill many sheets, but my articles on this subject show the stand I take.

"It will not pay any foundry, in the long run, to try melting with lowest percentage of fuel possible. Any one could melt 1 to 10, and even higher, but the question is, what kind of liquid metal would be produced?"

From George Vair, manager, J. D. Murray Manufacturing Company Foundry, Wausau, Wis.:

"Our average result for good, hot iron is 1 to 6, using Connellsville coke. We have no scrap at present, and our pig is heavy. I have melted at a higher ratio than this, but the castings would show cold shuts, therefore, I consider it more economy for me to melt 1 to 6 or even less than above that figure.

"There are better cupolas than the one we are operating, especially for coke, from which better results may be obtained; but were it known, more cupolas would be found melting 1 to 5 than over 1 to 7, and it is an injustice to foundrymen to advertise such big results merely to gain reputation."

From David Spence, Supt. Foundry, George W. Brown & Co., Galesburg, Ill.:

"In regard to melting, I could never do better than 1 to 7 and get good result. Where they claim such big things in melting, there are always two piles of castings, the good and the bad, and it is hard to tell which is the largest. My experience has been with a plain shell, and in every case I have remodeled to suit myself with good results.

"Last May I was on a visit to New York. While there I took charge of a cast for a friend of mine. They use a —— patent cupola, but I could not get the big results claimed, such as 1 to 12 and 1 to 14. I should like to make a visit to one of these shops where they get such great results. I have had charge of foundries in Nova Scotia, Boston, Connecticut and Illinois, and I have failed to find it only on paper."

From L. C. Jewett, Supt. Otis Bros. & Co., Yonkers, New York:

"The very best melting that I have ever done was 7½ to 1; that was in a good cupola, with an excellent blast and excellent Lehigh coal, and in a heat of 18 tons, in Hartford, Conn. At present we are melting about 6½ to 1. The Wyoming Valley coal I am using is not as hard or durable as the Lehigh Valley, consequently have to replenish the bed oftener. Considering the quality of the fuel, I do not feel discouraged with the new cupola I recently put up. The following is the result of a heat:

Amount of iron melted	20,000 lbs.
Amount of fuel consumed	3,100 "
Ratio of fuel to iron used	1 to 6·45

"It should be said, however, that I *melt* iron, and I claim that good results cannot be obtained unless iron is melted hot. My ladles and cupola are in good condition when the heat is over, and bottom drops clean.

"With good Lehigh coal in a heat of 10 tons I feel sure I could reach 7½ to 1, but one thing certain: I will have the iron hot enough to look like white watered silk as it comes from the spout, if it takes 4 to 1.

"Here is a heat at the rate of 8½ to 1:

Amount of iron melted	20,000 lbs.
Amount of fuel consumed	2,400 "

"We have a cupola that lines to 46", air chamber all round with 12 tuyeres evenly distributed, tuyeres 15" from bottom plate, No. 6 Sturtevant fan running 2,800 revolutions, and I want to see some one take off a heat at the above figures with best anthracite coal, and make a success of it. What I mean is, more castings will be lost for not running or poured short from the metal sticking to the ladles and thereby deceiving the moulders; the value of said loss would be greater than it would to have melted at the rate of 2 to 1 of coal.

"Let us analyze the two heats given at 1 to 8½. We have 700 pounds of coal saved over the figures in the first heat. Our coal costs us here $5.50 per gross ton. Taking the 700 pounds we have saved at the spigot $1 72, and wasted at the bung by bad castings, badly bunged-up ladles and cupola, and, worst of all, bad temper from melters to core boy, well, say $10 in a ten ton heat; that is not extravagant to lose by cold shuts, etc., as the result of dull iron.

"I am not conceited, and when you find any one who can melt on an average at big figures, please send him to me, as I am anxious to learn how it is done."

We will not stop to consider heats of 25 to 100 tons, for they are the exception and not the rule, but will take them as they average in foundries throughout the country. I have before me about all the reports of cupola workings that have been published for several years past, and I find among them a number from men who claim, with cupolas of 35-inch to 40-inch inside diameter, and in heats of less than 18,000 pounds of iron, to be able to melt from twelve to over nineteen pounds of iron to one pound of fuel. For instance, the following figures look well on paper:

Amount of iron melted.	Amount of fuel consumed.	Ratio of fuel to iron used.
17,900 pounds.	1,232 pounds.	1 to 14·54 pounds.
9,800 "	645 "	1 to 15·43 "
8,800 "	530 "	1 to 16·60 "
10,700 "	610 "	1 to 17·54 "
13,100 "	680 "	1 to 19·26 "

Simply because I have not been able to reach these high figures, or see any one else do it, I do not say that it cannot be done. I try to be progressive, and am a thorough advocate of any improvement in machinery or advancement in mechanical work, but I am not going to try to compel any man who is in my employ as foundry foreman to produce results in melting iron that are beyond anything I have known to be accomplished.

I would like to see some of these figures demonstrated, and I am now talking to the men who claim to produce them. I will present any man with $250 who will come to our works (Marshall, Texas) and melt 18,000 pounds of iron in a 38-inch cupola at a ratio of over fourteen pounds of iron to one of fuel, and have the metal fluid enough to produce good, clean, solid castings for locomotives, architectural work, and machinery. These figures will give the one who undertakes it the highest amount of iron to melt, and the lowest ratio of iron to fuel given in the above table.

I will furnish as good, or better, cupola to melt in than can be found in the average foundry; good blast, first class dry Connellsville coke, Scotch and American pig iron, and a regular run of car and locomotive cast scrap. All I ask is to do the weighing on the charging floor, and keep the figures jointly with the man who is to accomplish it, and I will take pleasure in publishing the results.—[Scientific American.

THE COST OF MAKING STEEL RAILS.

Iron Age.

The persistency of error and misrepresentation, not to use a stronger term, is strikingly illustrated by the frequent repetition of Mr. Scott's alleged figures of cost of steel rails at the Edgar Thomson works. We have shown their shortcomings in the past, and have published the correct data, which were given out through Mr. Randall, but the numerous letters which have reached us since then, prove that the latter have been overlooked, and emphasize the necessity of placing both side by side, although the items are not strictly comparable:

	Scott's estimate.	True cost.
Pig iron	$21.08	$19.83
Spiegeleisen and ferro-manganese	omittted.	3.24
Labor	4.09	4.32
Ingot molds, fire-brick, fire-clay, coke, oil, maintenance	not stated.	3.20
1.2 tons Connellsville coke at $1.35	1.62	
Total	$6.79	$30.59
Deduct 285 lbs. steel scrap		2.18
Total	$26.79	$28.41

The Scott estimate took Bessemer pig at $18, and added 13 per cent. waste from first to last on $26, making it $3.08. The actual cost figures were based on $17 for Bessemer pig, allowing a yield of 85.8 per cent., and making a deduction for steel scrap. Mr. Scott made the stupendous blunder of assuming that it required 1.2 tons of Connellsville coke to produce a ton of rails at Edgar Thomson. Now, that establishment employs the direct process—in other words, the pig iron is taken direct in a molten condition from the blast furnaces to the Bessemer converters. No coke is used for remelting, except, possibly, in the case of accident, and for remelting the spiegel. The omission by Mr. Scott of the latter item is another astonishing error, to which must be added the neglect to provide for such sources of expenditure like molds, fire-brick, clay, etc.

THE trial trip of the dynamite gun cruiser Vesuvius, was made a few days ago, and the expectations of Messrs. Cramp, the builders, were fully realized. They have have no fear as to her making the 20 knot an hour demanded by the Government. With such a record she will be, it is said, the fastest vessel of her size afloat.

Industrial Notes

Blast Furnaces:—

Lucinda Furnace, of the Lucinda Furnace Company Norristown, Pa., has blown in on Bessemer pig.

Charlotte Furnace, Charlotte Iron Co., Rochester, N. Y., is receiving a thorough overhauling, preparatory to going in blast about the middle of November.

Laughlin & Co., Pittsburgh, Pa., have just commenced the erection of a fourth blast furnace. It will be 80x22 feet, and will be completed in about six months.

Florence Furnace, of the Henderson Iron Company at Sharpsville, Pa., which was blown out last month for the purpose of relining and repairs, will resume operations again about November 1st next.

The meeting of the stockholders of the Sheffield Furnace Company, Ala., held on the 4th, was adjourned until Tuesday, the 16 inst. At that time it is expected that the question of leasing the furnace will be definitely decided.

The old Huron Furnace, at Jackson, Ohio, which has been idle since 1884, has been generally repaired and has been put in operation under the management of a new organization known as the Jackson Iron Company. The furnace has a capacity of 30 tons per day.

Rolling Mills:—

The 10 inch mill and shears for the McLean Railroad Spike Company, of Fremont, O., is nearly ready for shipment at the Lewis Foundry & Machine Company.

The Pittsburgh mills are doing a fair share of Government work. Over 1,000 tons of the various grades of steel plates, which are to be rolled at the Bessemer mill, at Homestead, for the cruiser Maine.

All the puddling furnaces at the Etna Iron Works, New Castle, Pa., together with the rolling mill, are now in operation. The guide mill is working double turn. The nail mill has been changed into a pipe mill.

The Apollo Iron & Steel Works, are running in all departments. The steel works are on double turn, and the galvanizing works, which are the largest in the United States, have not been shut down since they were built over two years ago. They are now working six pots. The Apollo Sheet Iron Mills, Laufman & Co., are also doing well.

Park Bros. will make 1,000 tons of plates for the Texas, and all the other material needed for these vessels in the way of channels, eye-beams, etc., will be rolled at the Thirty-third street mill of Carnegie Bros. & Co. At the present time, steel plates are being rolled at the Linden for Uncle Sam's first topedo boat. All the engine forgings are also made at the works here.

The new iron works at Duluth, are to consist of large rolling mills with two trains of rolls—one 18 inch train and one 10-inch train; two foundries—one for making car wheels, and the other for general castings; one shop for planing, mortising and otherwise preparing lumber for use in the making of cars; one machine shop, in which the heavy axles will be made and the wheels bored.

The Standard Iron Company, of Bridgeport, informs us that they have just completed an addition to their plant, which, in part, consists of a three-high train for rolling steel and iron sheets and plates, from No. 14 to ½ inch in thickness, and not exceeding 50 inches in width. This train is equipped with all modern appliances, insuring economical handling of product and satisfactory execution of orders. Fearing delays in getting this part of their extension into operation, the company has not heretofore offered its product, and are now consequently able to quote prices for prompt shipment. Sheets not heavier than No. 10 will be leveled by Britton's method.

Foundries:—

Messrs. Marchultz & Cantrell, National Iron Works, San Francisco., are engaged on plans for a new brick machine shop and foundry to be erected on the site of their old works.

Sweeney's foundry (W. Va.) is now working on some large castings for a new plate glass works at Kokomo, Ind. The demand for job work is good, and part of the force is working night work.

J. W. Garratt & Co., St. Louis, Mo., brass founders, have erected another addition to their foundry, with a frontage of 60 feet and a depth of 50 feet. The walls of the new structure are 18 inches thick, with a view to ultimately carrying three or four floors.

The St. Louis Malleable Iron Works continue idle, and will certainly not be restarted before next year. The scheme to convert them into a steel casting foundry has probably not been abandoned, but nothing will be done toward it before next January.

The Portage Lake Foundry and Machine Works (Houghton, Mich.), of which Messrs. Stephen Cleaves & Son are proprietors and managers, are showing just now some marked signs of growth and prosperity. The twelve acres of lake front land belonging to Mr. Cleaves, and containing his shops and dwellings, have been fairly well covered with buildings heretofore, but more of the space is soon to be occupied in that way. The machine shop addition, which was begun in June, is now completed, except the erection of the machinery. Its dimensions are 40x40 feet, while those of the shop as it stood before are 40x80 feet, making the completed building 40x120 feet. The principal piece in the machinery equipment, of the addition, is to be a lathe weighing 28 tons, the largest in the Upper Peninsula outside of the machine shop of the Calumet and Hecla Mining Company. It is being made by the Niles Tool Company, of Hamilton, Ohio, and will arrive in a short time. A strong stone foundation for a new foundry building, 62x150 feet in size has recently been laid around the foundry building now used.—[Houghton Mining Gazette.

An extensive branch foundry is to be erected at East Chicago, by the C. A. Treat Car Wheel Works, of Hannibal, Mo. Architect Clinton J. Warren has the plans for the plant nearly completed. The main foundry room will be 200x90 feet; the engine room 24x26 feet; the melting room 22x43 feet; the pitting room 25x62 feet; the machine shop 50x50 feet; the core room 26x40 feet, and the office 14x16 feet. Over the office will be a drafting room 14x16 feet, and a pattern shop over the machine shop 50x50 feet. A number of swinging pneumatic cranes will be constructed in the main foundry, and elevated tracks for the transportation of wheels, will be used throughout the building. Adjoining the engine room will be a suite of rooms for the workmen, arranged with lockers, closets, wash sinks, and hot and cold shower baths. The building will be fitted up with Sturtevant blasting fans for supplying the cupolas, running pneumatic cranes, and ventilating purposes. It will have a capacity of 400 wheels per day, which means the melting of 120 tons of iron. The foundry will cost $50,000, and be one of the most complete of its kind in the West.

Miscellaneous:—

Articles of incorporation of the Indiana Machine Works, of Fort Wayne, were filed Sept. 29. The capital will be $75,000, and they will manufacture all kinds of wood and iron working machinery.

Messrs. Lean & Blair state that a 20-ton Lash open-hearth steel furnace is working very successfully with producer gas, at the works of the Standard Steel Casting Company, Thurlow, making heats right along in seven hours.

The Baldwin Locomotive Works recently received an order, from the Northern Pacific Railway, for eighty-two new locomotives, one of the largest single orders, if not the largest, which has ever been placed by a road in operation.

John Hooper, Thomas Clark, Young E. Allison, J. T. O'Neal, of Louisville, Ky., and others, have chartered the Falls City Malleable Iron & Steel Works, to manufacture malleable iron and steel, edge tools, etc. The capital stock is $1,000,000.

Sir Henry Tyler, M. P., of London, England, President of the Grand Trunk road, has been discussing the work, with the other officers, of tunneling the St. Clair River, from Port Huron to Sarnia. The tunnel will be a mile in length, and will cost $2,500,000. The plant for boring and electric lighting is now on the ground, and the work will be completed within a year and a half. The Canadian Government is said to have given a bonus of $375,000 toward the project.

Alex. Laughlin & Co., engineers and contractors, Wade building, Cleveland, O., have received from Mr. James R. Ogden, president of the Knoxville Iron Co., Knoxville, Tenn., the following letter of interest: "Answering your inquiry of the 4th inst., in regard to the working of the two gas furnaces and producers recently constructed for us by your Mr. Reuleaux, it gives me pleasure to state that one has been tested for seven weeks, the other for about one week, and both have given entire satisfaction from the first. I think they are doing all you claim for them, and we are not only fully satisfied, but highly pleased with their working. I wish you success, and am satisfied your furnace is the best in use."

The Chatham Iron Company, which has been operating the mine near the Shakers, at Pittsfield, Mass., is sinking a new shaft sixty feet below its present one, which is 125 feet deep, and will extend the levels from the lower shafts. This will give the company three levels instead of two, and allow it to further extend its operations. The product goes to Chatham. Workmen are paid $1.40 a day for miners, $1 35 for truckers and shovelers, and $1 25 for common laborers.

The Lackawanna Iron & Coal Company, of Scranton, Pa., being no longer essentially a producer, as the entire product of its colliers is consumed by its steel works, has adopted a new title, a new charter being obtained, and it will be known as the Lackawanna Iron & Steel Company. The capital stock was also increased from $1,000,000 to $3,000,000. The new charter relieves the company of any individual liability of its members. There is no change in the management, as no election of officers was held.

The Magnetic Iron Ore and Steel Company, composed of capitalists from Atlanta and Birmingham, which was recently chartered in South Carolina, has just purchased for $60,000 the greater part of the magnetic iron ore tract, near the town of Black's, in York County, South Carolina. It was known that there was iron ore in this section, but nothing was done toward utilizing it until the Charleston, Cincinnati & Chicago road was run through there. The company will at once build a steel furnace and rolling mills, on the line of the Charleston, Cincinnati & Chicago Railroad.

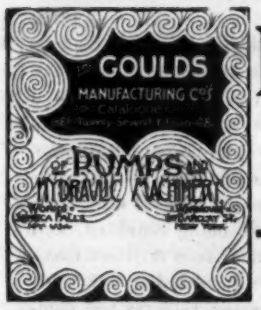
Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 17th day of November, 1888, for the labor and materials necessary in completing the following work: building second story over dining room and kitchen, shingling of the white and colored ward buildings, and rear portion of laundry building, plumbing, ceiling first floor joists, tin down spouting, painting buildings and fences, calciming and whitening walls, etc., brick paving, and straightening and securing fourteen brick gate piers, etc., required for the Marine Hospital, at Cairo, Ills.

Work will shortly be commenced remodeling the old rail mill at the Edgar Thomson Steel Works, Braddock, Pa., to convert it into a department for the manufacture of steel billets and blooms, of sizes ranging from 11 inch upwards. The old roughing rolls will be utilized, but new and improved finishing rolls will also be introduced, which are the invention of general manager W. R. Jones, and are much more rapid in movement than the old style rolls. The old rail mill has been idle since the operation of the present mill with a capacity of 1,500 tons per day was begun. The new blooming mill will be completed about the middle of December.

The Stearns Manufacturing Company, of Erie, Pa., are still adding to their boiler and engine works, which now cover an area of six acres. They commenced business in 1887, and have since that time built and equipped (1) machine shop, 80 by 300 feet, with floor space of 39,000 feet, provided with a splendid 15-ton crane, which commands the whole length of the building; (2) smith shop and boiler rooms, 50 by 147 feet, with 7,350 feet floor space; (3) boiler works, 80 by 200 feet, with floor space of 16,000 feet; (4) foundry, 85 by 200 feet, floor space, 17,000 feet; (5) carpenter shops and storage rooms to balance of territory. The buildings are all especially adapted to their uses, and, altogether, make one of the most valuable and sightly plants in the country. They employ 450 hands, and are taxed to the utmost to meet their orders.

We have received from the Herendeen Manufacturing Co., Geneva, N. Y, their new publications on steam and hot water heating, and also their essay entitled "Modern Greenhouse Heating," which latter will be found of special interest to florists and all owning conservatories. This company is manufacturing the celebrated Furman boiler, a low-pressure automatically governed apparatus for the domestic warming of all kinds of buildings, from a cottage up to a good sized church. This boiler is very durable and simple in construction, and should be, we think, very efficient and particularly economical in consumption of fuel. The combustion is good, the heating surfaces well arranged, and the circulation rapid. It is used successfully in burning soft coal as well as hard, therefore, combining two features, seldom found in the ordinary house heater,

—SEND FOR—



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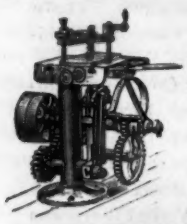

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Cutting Keyways and making Keys from 24 inches long down to the smallest work, with accuracy and rapidity.

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BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

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COMMISSION DEALERS IN

IRON ORES,

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Sales Agents for following brands Lake Superior Charcoal Iron:

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INDUSTRY FILE WORKS, A. & H. Gough, manf'rs of Files and Rasps, equal to the best English file. Old files re-cut. All kinds of Job Grinding. Office and Works, 38 Columbus and 33 Winter street 13

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THE EBERHARD MF'G CO. manfrs of Carriage, Wagon and Saddlery Hardware. 25

Hardwood Lumber.

MARTIN & BARRISS, dealers in all kinds of Hardwood Lumber. 130 Central Way. 51

Lumber.

FISHER, WILSON & CO., Wholesale lumber dealers (pine & hardwood), rough and dressed lumber, timber, lath, shingles, etc. 47 Central Way. 82

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MCNEIL, J. C. CO., Steam Boilers, Heavy Sheet Iron Work, &c. Repairing promptly executed.

TAPLIN RICE & CO., manuf'rs. of Stoves and Hollow Ware, dealers in Tinners' Stock etc. 04

WEBSTER, CAMP & LANE MACHIN' CO., Founders and Machinists, 12 Main street. 84

Alliance, O.

CHAPMAN G. L., builder of Engines and Machines Also Jobbing and Repairing.

Canton, O.

NOVELTY IRON WORKS, Mill Work, Shafting, Engines. Imperial job printing press etc. 73

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ISHAM, W. S. Tin cans of every description Large job lots special prices. Correspondence solicited. 81

Meadville, Pa.

CURRY & CO. general jobbers in Castings of all kinds. 43

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MANSFIELD STEAM BOILER WORKS, Man'frs of Steam Boilers, Oil and Water Tanks, and all kinds of Sheet Iron Work. 03

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For holding drills and reamers for lathe work. Prevents breaking or slipping. Can also be used for drilling and reaming holes by hand, and for reaming holes under drill presses, etc. Five holders in a set. Made with ouble handle, when required.

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WITH RUBBER CUSHIONED JAWS

THE FINEST FINISHED, THE LATEST IMPROVEMENTS,

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The Daisy Patent Natual Gas Burner.

For all kinds of Stoves, Furnaces, and Open Grate. Will produce more heat than any other burners ever made. Manufactured by

Harmon, Gibbs & Co., - Corry, Pa.

MARKET REVIEW.

OFFICE OF IRON TRADE REVIEW.
CLEVELAND, O., WEDNESDAY EVENING, October 24, 1888.

Iron Ore.

The situation is one that necessarily fills careful and conservative buyers with doubt as to the future of the ore market, considered in the light of the probable wants and the means for filling them during the season of 1889. It is not too early at this time, to take into consideration the coming season, for this year's ore has long been sold up, and sales, being now restricted to the daily production, there will not be much chance to lay up much in the way of stock piles against the opening next May, of lake navigation. It is now agreed, on all hands, that the railway interests will be among the heavy buyers to make up for their rail shortage in '88, as well as with a view to extensions in '89. On the other hand, much will depend on the state of affairs that will govern a month or so, hence, at the close of navigation, when an opportunity for review will be afforded those interested by the usual reports of ore, on dock, sold and unsold. If the amount is small, the ore market may be depended upon to open briskly in January—something devoutly hoped for by the ore interest.

Pig Iron.

The furnaces are all sold up, in large orders, for the balance of the year, which accounts for the lack of current sales in considerable quantities. Pig metal, both foundry and forge, is in excellent demand, while Bessemer iron is scarce. The consumption is as heavy as ever it was, and the already decimated stocks are being still further reduced from day to day, a fact that imbues furnacemen with confidence in the steadiness of the market, and which is a guarantee of continued activity through 1889. Another indication that points in the same direction is found in the inquiries, by mill men, for 1889 iron which, however, is being uniformly refused by furnacemen, who want to know a little more of the ore prospects before committing themselves. Aided by economical furnace plants and reduced rail freights the Western furnaces are surely, and to a marked extent, making inroads upon Eastern markets, thus enlarging their market and insuring for the prime all lake ore iron of this vicinity, custom which will be found to stimulate consumption should the Western markets weaken in their demand. We quote f. o. b. cars, Cleveland, four months:

No. 1 Bessemer	$18 70@19 20
No. 1 foundry	18 20@19 70
No. 2 fonndry	17 20@17 70
No. 1 gray forge, red short	16 70@17 20
No. 2 gray forge, neutral	16 20@16 70
No. 1 American Scotch	18 20@18 70
No. 2 American Scotch	17 20@17 70

Manufactured Iron.

There is a sharp and active demand for bar iron, caused largely by the large orders recently placed for cars. The Jersey Central has given an order for 3,000 cars, the Reading for 2,000, and the Pennsylvania system is so short of rolling stock as to be seriously crippled. The price in large lots is $1.70, and the indications point to an advance. Sheet iron, which hitherto has been so scarce as to be almost out of the market, is now a little more plenty, and will be more so as the close of the season draws near. Still the price is firm, being quoted at $2.90 for No. 24. Building shapes are strong, and continue in good demand. Gas pipe has made two jumps in ten days, and is now quoted at 52½ and 62½ off, for small and large black, respectively. All the pipe mills are running night and day, and are barely able to supply the enormous demand.

Scrap Iron.

Very little is to be reported in this market. Old American rails continue high, but are accumulating so fast that lower prices are only a question of a short time. No. 1 wrought scrap, axles, and turnings find a ready market, but car wheels are dull and miscellaneous scrap is not wanted.

Hardware.

Jobbers report an excellent trade in light and heavy hardware and shelf goods, and there appears to be no abatement in the amount of transactions. Barring the flurry in metals, prices are full, and the business is all that can be asked for. Steel nails sell at $2 out of store.

ST. LOUIS PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co

There has been considerable inquiry and some sales made for delivery, beginning December and running six months into the next year. A number of consumers, however, prefer to wait until after the election. Old wheels have advanced possibly 50 cents per ton within the past ten days, but old rails have declined, possibly 75 cents. The stove foundries are all running full, and, taking business as a whole, it is entirely satisfactory to the seller as well as to the buyer. We quote for cash f. o. b. St. Louis (Oct. 22):

Charcoal Foundry—Southern No 1, $18.00@$19.00; Southern No. 2, $17.50@$18.50; Missouri No 1, $17 00@18 00; Missouri No. 2, $16.50@$17.50. Coal and Coke Irons.—Ohio Softeners, $18 00@21 00; Southern No. 2, $16 50@$18 00. Mill Irons—Missouri, $16 00@16 50; Southern No. 1, $15 00@$16 50; Southern No. 2, $15 00@16 00. Car Wheel and Malleable Irons.—Lake Superior, $20 00@21 50; Southern, $20 00@24 00; Connellsville Coke, East St. Louis, $4 45; Connellsville Coke, St. Louis, $4 60.

CINCINNATI PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co.

The market, for iron, may be described as dull, and strong inquiries are only moderate, and the firm position of sellers tends to discourage sales. The further reduction of stocks in the face of increased production, and the oversold condition of nearly all furnaces, gives a stiff back-bone to makers and dealers. As near as can be ascertained, the current consumption of iron in the United States is the largest of any period in our history, not excepting the great railroad years. At the same time, it must be understood, there is abundant furnace capacity, and the danger of an iron famine is not immediate. In all branches of iron trade, the greatest interest is felt in the approaching election, as involving results of importance to all. We quote for cash, f. o. b., Cincinnati (Oct. 20):

HOT BLAST FOUNDRY.—Ohio and Southern Coke, No. 1, $16 50@$17 00; Ohio and Southern Coke, No. 2, $15 75@$16 00; Ohio and Southern Coke, No. 3, $15 00@$15 50; Ohio Soft Stonecoal; No. 1, $17 00@$17 50; Ohio Soft Stonecoal No. 2, $15 50@$16 00; Mahoning and Shenango Valley, $17 50@$18 50. CHARCOAL IRON.—Hanging Rock Charcoal No. 1, $21 00@$22 50; Hanging Rock Charcoal No. 2, $19 50@$22 00; Tennessee and Alabama Charcoal No. 1, $18 50@$19 50; Tennessee and Alabama Charcoal No. 2, $17 50@$18 00. FORGE—Strong Neutral Coke, $14 75@$15 00; Mottled Neutral Coke, $13 75@$14 00; Cold Short Coke, $14 50@$14 75. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $20 00@25 00; Hanging Rock Cold Blast, $22 00@$25 00; Lake Superior Malleable & Car Wheel, $22 00@$21 00.

DETROIT PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by William F. Jarvis & Co.

More inquiries and for larger amounts have been received during the week than for some time past, and what is more to the point, several orders for round lots of Lake Superior charcoal have been placed. A large demand for high numbers still continues, and very few furnaces have any quantity of these grades unsold. Consumers are still asking for quotations for next year's delivery, and some furnaces refuse to quote at all, and others that are willing to quote, ask from $1.50 to $3.00 per ton advance over present prices. Some Mahoning Valley furnaces are having trouble in shipping No. 1 iron as fast as called for on old orders, and are unable to offer for prompt delivery at any price. There is a great scarcity of cars, and this is a source of annoyance to shippers, as they cannot get cars promptly even when they have the iron on hand. We report business as satisfactory, and the outlook as favoring the furnaces with quotations as follows (Oct. 22):

Lake Superior Charcoal, all numbers, $20 00@$20 50; Lake Superior Coke, all ore, $19 75@$20 25; Lake Superior coke, cinder mixed, $18 50@$19 00; Standard Ohio Blackband, $19 75@$20 25; Southern No. 1, $17 75@$18 25; Southern Gray Forge, $16 25@$16 75; Southern Silvery, $17 00@$17 50; Jackson County (Ohio) Silvery, $18 50@$19 00; Old Wheels, $20 50@$21 50.

LOUISVILLE PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Geo. H. Hull & Co.

The market is quiet, prices are fairly held, and some buyers are willing to make purchases of iron for extended delivery. Furnaces consider the situation satisfactory, and in many instances are accepting orders for future delivery. There have been a few large sales during the week, in lots of 500 tons; these, however, at a slight concession in price. The demand for old rails has fallen off, and the market is decidedly weaker. Old rails are held at $23, and old wheels at $21. We quote as follows (Oct. 22):

Southern Coke, No. 1, Foundry, $17 00@$18 00; Southern Coke, No. 2, Foundry, $16 00@$16 50; Southern Coke, No. 2¼, Foundry, $15 50@$16 00; Hanging Rock Coke, No. 1, Foundry, $17 25@$17 75; Hanging Rock Charcoal, No. 1, Foundry, $21 00@$23 25; Southern Charcoal, No. 1, Foundry, $18 00@18 50; Silver Grey, different grades, $14 50@$15 25; Southern Coke, No. 1, Mill Neutral, $14 75@$15 25, Southern Coke, No. 2, Mill, Neutral, $13 75@$14 75; Southern Coke, No. 1, Mill, Cold Short, $14 25@$14 75; Southern Charcoal, No. 1, Mill, $15 75@$16 50; White and Mottled, different grades, $13 50@$13 75; Southern Car Wheel, Standard Brands, $23 00@$24 00; Southern Car Wheel, other brands, $19 25@$21 25; Hanging Rock, Cold Blast, $22 25@$25 25; Hanging Rock, Warm Blast, $19 25@$20 25

CHICAGO PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Rogers, Brown & Co., W. W. Backman, Resident Agent.

The business for this week has been fairly good. There is strong demand for car wheel irons, and some heavy contracts are soon to be placed. Shipments on contracts continue rapidly, furnaces holding firm to present prices, and adverse to making long deliveries, except at an advance of from 50 cents to $1.00 per ton. Prices remain same as last quotations. Look for higher prices after election.

The Cost of a Car Wheel.

Advices from Eaton, Pa., state that freetrade orators in that section have asserted that a 500 pound car wheel sold for $12, and that the entire cost of labor was only 85 cents. They state the case in such a manner as to try to mislead the public into believing that the manufacturer pockets enormous profits. In answer to this, the following expert testimony has been given;

Chilled car wheels are made from this kind of pig iron and a 500 pound wheel sells at $8, not $12. Here is the inaccuracy in the freetrade statement. The company offers to furnish 10,000 of these wheels at $8 if the orators in question will put up the money in advance.

Now as to the labor item. The company states that the average cost of charcoal pig iron used in casting car wheels is $26.50 a ton, from which four wheels can be cast. Old car wheels to the extent of 25 per cent can be used, which proportion at $19 per ton, the present price, would bring the cost of the metal, unmelted—three-quarters charcoal pig iron, one-quarter old car wheels—to $24.62½ per ton. The item of labor in this amount is 90 per cent. of the whole. The labor, therefore, on the metal for one wheel, unmelted, would be one-quarter of 90 per cent. this cost of $24.62½, or $6.16, and this the wheel manufacturer pays out before the materials come to his mills. Then the items as follows for one wheel: Cost of melting, core drying etc., 20 cents; sand, molds and cores, flour and facing, 15 cents; foundry labor of moulding and casting, 85 cents; outside work, unloading pig iron, coal, etc., 10 cents; repairs, wear and tear, taxes insurance, motive power and delivery charges consume 40 cents more, and the cost is $7.86, leaving the company just 14 cents profit on each wheel.

The company adds that "the fact is that all labor required in making car wheels from the raw material or minerals used fully equals 75 per cent. of the cost. The moulders who make wheels earn $3.50 a day, as against $1.25 paid in England. Should all the raw materials up to the finished wheel be reduced to the English standard, the wheels could probably be made at a reasonable profit to the manufacturer."—[Industrial World.

What is Latent Heat?

Heat has its equivalent in mechanical work, and when heat disappears, work of some kind will take its place. When a body changes from the liquid to the gaseous form, the molecules have to be separated and placed in different positions with regard to each other. This calls for an expenditure of work. This work is supplied by heat, which disappears at the time. One can hold his hand in steam escaping from the safety valve of a boiler for this reason. The heat of the steam disappears in pushing apart and rearranging the molecules of the steam as it expands when it leaves the safety valve.

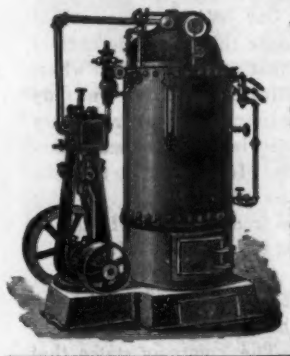
The term latent heat, as commonly used, means the amount of heat which disappears when water changes from a liquid into steam. This is considerable, as will be seen by consulting any table of the heat contained in steam, and the water from which it comes.

Water at 212° contains 180 units of heat. Steam at 212° contains 1,146 units of heat. The latent heat is the difference of 966 units. Such a large quantity disappears when liquid water changes to steam, that boiling cannot be raised above 212° no matter how hard it is boiled. The heat becomes latent, and the mechanical work, or rather molecular work, is sufficient to take up all that is supplied by the fire.

The specific heat of air at constant pressure being 0·2377, the specific heat of water, which is 1, is therefore, 4·1733 times greater under ordinary circumstances. A pound of water losing 1° of heat, or one thermal unit, will consequently raise the temperature of 4·17 pounds, or, at ordinary temperatures, say 50′ of air, 1°. A pound of steam at atmospheric pressure, having a temperature of 212° F., in condensing to water at 212° F., yields 966 thermal units, which, if utilized, would raise the temperature of 5×966=4830′ of air 1°, or about 690′ from fi° to 70° F.—[Light and Heat.

THE Latrobe Steel Works, (Pa.) are pushing work on their buildings, which will be under cover before Winter. The machinery is to be delivered by February 1st next. The principal product will be locomotive tyres. The tyre mill is designed by Mr. Julius Kennedy, chief engineer, and will be driven by a pair of Porter-Hamilton engines, built by William Tod & Co., Youngstown, O.

THE CLINE ENGINES.



The most compact, best built and cheapest engine manufactured. Boilers of Steel tested to 150 pounds pressure. A written guarantee with every outfit.

2-Horse Power Engine and Boiler, Complete, Ready to Run, **$150.**

4-Horse Power, - $230.

Usually rated at 3 and 5 Horse Power by other makers. 2, 4, 6, 8 and 10 Horse Power Stationary, Yacht and Launch Engines and Boilers. Write for Catalogue.

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Providence Tool Co., hand cuffs. $15 ₱ doz...dis 10
Providence Tool Co., leg irons $25 ₱ doz.....dis 10
Tower's.....dis 15

Hardware.

Door or Taumb Latches.

Per doz	Nos. 0	1	2	3	4	
Sargent's	.90	1 00	1 18	1 35	1 50	dis 60&10

Roggin's Latches.....₱ doz. 30@35c
Bronze Iron Drop Latches.....₱ doz. 70c net
Jap'd store door handles—Nuts, $1 62; Plate $1 10; no plate $0 88.....net
Barn doors.....₱ doz $1 80, dis 25
Wrought chest.....dis 50 & 10 & 10
Surface chest.....dis 70
Flush chest.....dis 70
Lifting.....dis 70
Saw and plane.....dis 40&10
Hammer and hatchet.....dis 25&5&2
Brad awl.....₱ gross $2
Hickory framer chisel, assort.....₱ gross $4 50 / Hickory framer chisel, large.....₱ gross $5 00 / Apple framer chisel, assorted.....₱ gross $5 00 / Apple framer chisel, large.....₱ gross $6 00 / Socket framer chisel, assorted.....₱ gross $3 00 / Socket framing chisel, assort.....₱ gross $5 00 } dis 40
File, assorted.....₱ gross $2 75 / Auger, assorted.....₱ gross $5 00 / Auger, large.....₱ gross $7 00 } 25

Hangers.

Barn Door, old patterns.....dis 60&10 &10
Climax (Anti-Friction).....dis 55
Star.....dis 40
Scranton.....dis 25
Kidder's.....dis 50&10
Terry's Patent, 5 in., 12.00; 3½ in., 10.00, dis 50 @
Paragon.....dis 40
Richards.....dis 20&10&10

Harness Snaps

German, new list.....dis 40&10
Covert, New Patent, new list.....dis 50&5&2

Hay Knives.

Lightning.....per doz. $11.50 net
Electric.....₱ doz $17.00 dis 30

Hinges.

Wrought Strap and T Hinges.....6½&10&2@70&10
Screw, hook and strap, 8 10 12 in.....3½@4
to 36 in.....2¾@3
Screw hook & eye hinges...½ ₱ doz 1.50 / ⅝ 2.45 / ¾ 3.80 } ...dis 10
Gate, western.....₱ doz $4 40, dis 55
Gate, N. E.....₱ doz $7 00, dis 55
Gate N. E. reversible.....₱ doz $5 20, dis 55&15
Gate Clark's Nos. 1. 2. 3.....dis 60&10@65 &10&0
Gate, N. Y. State.....₱ doz $5 00, dis 55&15
Gate, automatic.....₱ doz $12 50, dis 50
Gate, common sense.....₱ doz pair $4 50, dis 50
Gate, Shepard's.....dis 60&1

Hollow-Ware.

Stove Hollow-Ware, Ground dis.....60&10&10
" " Undground.....70&10
Enameled Kettles.....dis 70
Saucepans.....dis 40
Galvanized Tea-Kettles

Inch	6	7	8	9
Each	.55	60	65	75

Hoes.

Garden, mortar.....dis 65&5
Planter's, cot.....dis 65&5
Canton.....dis 65&5

Hog Rings and Ringers.

Hill's rings.....$2 50
" ringers.....{ Old Style $3 00 / Improved $4 50
Blair hog ringers.....₱ doz $3.00

Hooks.

Bird Cage, Sargent's list.....dis 60&10&10
Belt.....dis 75&10
Clothes Line Sargent's list.....di 60&10
Ceiling Sargent's list.....dis 55&10
Coat and Hat, Sargent's list.....dis 55&10
Wire Coat and Hat, Gem.....dis 45
Wrought Staples and Hooks & Staples, list Jan 12, 1887.....dis 80&20
Wire Screw Hooks and Screw Eyes, dis 75&10
Hooks and Eyes—Malleable Iron.....dis 70
Hooks and Eyes—Brass.....dis 60&10&10

Horse Nails.

No.	10	9	8	7	6	
Ausable. ₱ lb	23	24	25	26	28	dis 25&10 to 25&10&10
Putnam. ₱ lb	19	20	21	22	24	.....dis 15

Essex.....3½&5

Burden.....₱ keg $4.25
R. I. Horse Shoe Co., Perkins' Imp. at factory.....₱ keg $4 25
Mule Shoes, at factory.....₱ keg $5.25

Hose, Rubber, Boston Belting Co's.

Standard.....70
Extra.....55&10
Best.....45&10

Ice Picks, Chisels, &c.

Am. Ice Chisel Pol'd.....₱ doz. $3.00, dis 20

Ice Cream Freezers.

American.....50&10
Gem.....55&10
Crown.....50&10

Ice Tongs.

Champion.....₱ doz $4.00, dis 25&10
Family.....₱ doz $2.75, dis 20@25

Jack Screws.

Illinois Bolt Co. list.....dis 70

Kettles.

Brass, 7 to 17 inches inclusive.....₱ lb 22c. net.
Brass larger than 17 inches.....₱ lb 24c.
Enameled and Tea Kettles.....See Hollow Ware

Keys.

Eagle, cabinet, trunk and padlock....dis 33⅓ and

Knives.

Russell's Butcher.....net
Moran's Shoe Knives.....dis 20

Knobs.

Carriage, Japanned.....₱ gross 80c, dis 60&10
Base, Rubber Tip.....dis 70&10&5
Hemacite Door Knobs, new list.....dis 40@40&10
Door Mineral.....75c
Door Por. Jap'd.....90c
Door Por. Por.....3 00@3 25
Door Por. Plated.....2 90@3 00

Ladles.

Melting, Sargent's.....dis 55&10
Melting, Monroe's Patent. ₱ doz $4.00, dis 25&10
Melting, P. S. & W.....dis 25&10

Lanterns

Tubular No. 0.....$4.50 per doz
" " 1.....6 50
Tubular, Lift Wire, No. 0, ₱ doz.....6 0
Tubular, Lift Wire, No. 1, ₱ doz.....7 00
Police, Small, $6.00; Med., $7.25; Large, $9.75.....dis 20 & 2

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Pittsburgh & Wheeling Coal Co., Cleveland, O..... 10

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McClure & Schuler, Pittsburgh, Pa..... 2

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For Sale.

A 6"x10" SELF-INKING Foot Power Printing Press; will do good work. Address J. M., care Iron Trade Review, Cleveland, O. tf

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ONE OF DUNN'S HOISTING MACHINES, with over 40 feet of chain. Good as new; capacity, 600 lbs. Address Dunn, care Iron Trade Review, Cleveland, O. tf

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Engineers' Specialties. The Crescent Lubricating Compound and Automatic Grease Cups will effect a saving of 75 per cent. over oil. Investigate their merits. CRESCENT MF'G. CO.,
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To Steam Engine Builders, Shop Rights and Licenses to Build and Sell the

QUINT Automatic Shaft Governor.

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Cleveland Printing and Pub. Co
Cleveland, Ohio

Locks, Bolts, etc.

P. & F. Corbear, Locks & Bronze Goods.

Door locks, knobs and latches.....dis 60
Escutcheons and keys .....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60
Lever bell pulls, genuine bronze.....dis 60&10
Butts, genuine bronze.....dis 60&10
Butts, bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges & flaps genuine bronze....dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull genuine bronze.....dis 66⅔
Letter box plates, genuine bronze.....dis 60&10
Barn door locks .....dis 33⅓

Lemon Squeezers.

Porcelain lined.....℔ doz $6 00, dis 25&35
Wood.....℔ doz $3 00. dis 55
The "Boss".....℔ doz $2.50
Dean's No. 1. ℔ doz $6 50: 2, $3 35;3, $1 90....dis
Little giant.....dis 50

Lines.

Cotton Chalk.....dis 40
Silver Lake, Braided, N , 0, $6.00; No. 1. $6.50; No. 2, $7.00; No. 3, $7.50 ℔ gross .....dis 25
Masons' Linen.....dis 40
Wire Clothes, No 18, $3.75; No 19, $3.25; No. 20 $2.75;.....

Mallets.

Hickory .....dis 20&10
Lignumvitæ.....dis 2(&10
Penfield Block Co., Lignumvitæ and Hickory.....dis 30

Mattocks.

Regular list... ..... dis 60@60&5

Meat Cutters.

Dixon's (P.S.&W.) 1 2 3 4
℔ doz. $14.00 $17.00 $19.00 $30.00 dis 4(
Draw Cut Nos. 5 2 6 8 10
Each.....$50.00 $75.00 $80.00 $225.00 400.00
dis 20@25
Woodruff's (P S & W) per doz No 100 No 150
$15 $18dis 45
Hale's—Nos. 11 12 13
$27 $33 $45
dis 70
Enterprise.....dis 33⅓

Mincing Knives.

Am. (2d quality), ℔ gro, 1 blade, $7; 2 blades, $12; 3 blades, $18.....net
Smith's, ℔ doz. single, $4 50; double, $6 50
dis 40

Money Drawers.

Tucker's ℔ doz.....$18 @20

Molasses Gates.

Stebbins' pat .....dis 70
Stebbins' genuine .....dis 66⅔&10
Stebbins' tinned ends.....dis 40&10
Lincoln's pattern.....dis 66⅔&10
Scoville.....$7 45&10

Nails (wire).

List July 14 1887.....dis 70
Standard Penny Nails, ℔ keg card rate
{ Car lots.....$2 55
{ Less than car lots, $2 65

Nuts and Washers.

Size of bolt in.....	¼	5-16	⅜	½	⅝	¾	1
Square.....	8¼	7	5½	4¼	4	3¾	3¼
Hexagon.....	15½	11½	8¼	6	5¾	5¼	5
Washers.....	9	8	7	5	4½	4½	4¼

In lots less than 100 lbs, ℔ lb add ½c, 1lb boxes add 1c to list

Nut Crackers.

Table (Humason & Beckley Mfg. Co.).....dis 40
Blake's pattern.....℔ doz. $2 00, dis 10
Quakenbush.....$5 00 net

Oakum.

Government.....℔ lb 8 c
U. S. Navy.....℔ lb 7¼c
Navy .....℔ lb 6½c

Oilers.

Zinc and Tin.....new list dis 60&10
Brass and Copper.....new list dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz.....dis 10@ 10&10

Packing, Steam.

Boston Belting Co .....dis 60
American Packing. .....10@11c
Russia Packing.....16c
Italian Packing.....16c

Pencils.

Faber's Carpenters' .....high list, dis 50
Faber's Round Gilt.....℔ gro $5.25 net

Picks.

Railroad, 5 to 6 lbs.....$12 dis 60@60&5
... .. 6 to 7 lbs.....$13 dis 60@60&5

Pinking Irons.

℔ doz ..... 65c. net

Picture Nails.

Brass head, Sargent's list..... } dis 50&10&10
Brass head, combination list..... .....dis 50&10
Porcelain head Sargent's list, dis.....50&10&10
Porcelain head, combination list.....dis 40&10

Plane Irons.

Sandusky Tool C ..... dis 20&10

Pliers and Nippers.

Button's Patent .....dis 40
Hall's Pat. Compound Lever Cutting Nippers, No. 2, 5 in., $13.50; No. 4, 7 in., $21 00 ℔ Doz. .....dis 20&10@33⅓
Gas Pliers.....dis 50&10
Humason & Beckley .....dis 50
P. S. & W. Tinners' Cutting Nippers add 6 per cent. dis 10

Plumbs and Levels.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Post Hole and Tree Augers.

Samson Post Hole Digger..℔ doz. $36.00, dis 20&10
Eureka Diggers.....℔ doz. $15.00 @ $16.00
Champion.....per doz $9.00
Vaughan's Hollow Tube Post Hole.....$12.00 dis40

Potato Parers.

White Mountain.....℔ doz $5.00@$5.50
Antrim Combination.....℔ doz $8.00
Hoosier .....℔ doz $13.50

Pruning Hooks and Shears.

Disston's Combined Pruning Hook and Saw ℔ doz $18.00.....dis 25
Disston's Pruning Hook.....℔ doz $12.00 dis 25
Pruning Shears .....℔ doz 3.75@$4.00 net

Pulleys.

Hot House .....discount 60&10
Japanned Screw.....discount 60&10
Brass Screw.....discount 60&10
Japanned Side.....discount 60&10
Japanned Clothes Line.....discount 60&10

Pumps.

Cistern, best makers.....dis 50@10&60
Pitcher spout, best makers...dis 60&10@60&10&10
Pitcher spout, cheaper goods... dis 70&5@70&10&5

Punches.

Saddlers' or Drive.....℔ doz. good quality. 65@75c
Bemis & Call Co.'s Cast Steel Drive.....dis 50&5
Bemis & Call Co.'s Springfield Socket.....dis 50&5
Solid Tinners.....℔ doz. $1.44, dis 55

Rails.

Sliding Door, Wrought Brass.....℔ lb 35c dis 20
Sliding Door, Iron, Painted... ℔ foot 6c dis 40&10

Rakes.

Cast Steel..... dis 65&5
Malleable..... dis 65&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher..... $10 @£...dis 10
Rifle Razor.....$9 50 net

Rivets.

Iron, Thousand, list November 17 .....dis 50
Iron, Ordinary, Cooper's Block and Carriage, list November 17.....dis 50
Copper .....dis 50

Rods.

Stair, Brass.....dis 25&2

Rollers.

Barn door, Sargent's list, ... dis 60&10&10
Acme (Anti-Friction).....dis 55

Rope.

Manilla. ½ inch and over.....11½c
Sisal, ½ inch and over.....11c

Rules.

Boxwood..... ..... discount 80@80&10

Sad Iron.

From 4 to 10 lbs.....per 100 lbs 3c
Self-heating.....℔ doz $9 net
Self-Heating, Tailor's.....℔ doz $18 net
Mrs. Potts's Irons, ... dis 40&10
Enterprise Star Irons.....discount 40&10

Sash Weights

Per ton .....$22.50@$25.00

Saws.

Disston's Circular..... discount 45
Disston's hand panel, rip &c..... discount 25
W. M. & C., Champion Regular.....per foot 23c
W. M. & C., " Thin Back.....℔ ft 24c

Saw Frames.

White, Vermont.....℔ gross $12 00
Red, polished & varnished ℔ doz $1.50, ...dis 25

Saw Sets.

Aiken's Genuine.....$13.00, dis 50 &10
Morrill Saw Sets No. 1 $15.00; No. 3 and 4 $24.00 .....dis 40 &10

Scales.

Hatch, Counter, No. 171 .....℔ doz $21.00
Hatch, Tea, No. 161.....℔ doz $6.75@7.00
Chatillon's Grocers .....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams. List of January 12, 1882 dis 50&10

Scrapers.

Adjustable Box Scraper (S. R. & L. Co.) $6.50.....dis 30&10
Box, 1 Handle.....℔ doz $4.00, dis 10
Foot.....dis 50&10

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles dis 65&10
Stanley R. & L. Co.'s Black Handles.....dis 60&10
Sets Interchangeable.....℔ doz $18.00 dis 25

Screws.

Wood Screws—List Jan 27, 188.. Extra 10 to 50 often given

Flat head iron.....	dis 70
Round head iron.....	dis 65
Flat head brass.....	dis 65
Round head brass.....	dis 60
Flat head bronze	65
Round head bronze.....	60
Machine, flat head, iron.....	dis 55
Machine, round head, iron	50
Bench and hand—	
Bench, iron	25&10
Bench, wood, beech, per dozen $2.25.....	
Bench, wood, hickory.....	20 & 10
Hand, wood.....	20&10
Lag or coach.....	dis 66⅔@70
Coach, patent gimlet point.....	66⅔@66⅔&5
Bed.....	25&5
Hand rail, ...	66⅔&10

Saw Tools.

Atkins' patent.....℔ doz sets $6 00

Shears.

American (Cast) Iron.....dis 75&10
Pruning .....See Pruning Hooks and Shears
Garnard's Lamb Trimmers.....℔ doz $4.00
Tinners'.....dis 20&2
Seymours List, Dec. 1881..... dis 60 &10&5
Seymours Tailor's Shears.....dis 33⅓

Scroll Saws.

Lester, complete, $10.00..... ..dis 25
Rogers, complete, $4.00. .....dis 25

Sheaves.

Sliding Door R. & E. list Dec 18, 1885... dis 55&2
Sliding Door, Patent Roller.....dis 60&10&2
Sliding Door, Pat'nt Roller, Hatfield's..... dis 70
Sliding Door, Corbin's Anti-Friction Dec. 18, 1885 dis 60&2

Ship Tools.

L. & I. J. White.....dis 20 & 5

Shovels and Tongs.

Iron Head.....50&10&5
Brass Head.....50

Sieves.

Metallic, new list.....dis 60&10

Flour sifters { Victor.....$2 00 / Hunter.....$2 25 / Comet.....$1 25

Slates.

School, by case..... dis 50&5@50&10

Spoke Shaves.

Iron.....dis 30
Wood .....dis 30

Spoke Trimmers.

Bonney's.....℔ doz $10.00 dis 50
Stearns'.....℔ doz $9.00 dis 20&10

Spoons.

Basting Spoons ..... dis 70&10
Britannia. .....dis 50
Rogers Bros. .....dis 50&10

Squares.

Steel and iron ..... } dis 70@10&75
Nickel plated..... }
Disston's try square and T bevels ..... dis 45
Winterbottom's try and miter.....dis 30&10

Steelyards.

dis 40&10@50

Stocks and Dies.

Blacksmith's .....dis 35
"Lightining" screw plate .....dis 1F

Stone.

Hindostan, No. 1, 6c; Axe, 4½c; Slips 9c
Washita Stone .....No. 1, ℔ lb 20
Turkey Oil Stone.....4 to 3 in.....℔ lb 40c
Turkey Slips.....$1.00@1.50
Washita Slips No 1.....℔ lb 37@38
Washita No 2 stone.....℔ lb 15c
Arkansas Stone 2.00

Stove Boards.

Zinc.....70
Oxidized.....45

Shovels and Spades.

Ames' list Nov 1 1885..... .....discount 26
Dennis.....5.50
Hussey & Binns, rail road 8.00

Stove Polish.

Joseph Dixon' s.....℔ gross $6 00 dis 10
Gem .....℔ gross 4 50 dis 10
Gold medal.....℔ gross 6 00 dis 25
Rising Sun.....℔ gross $5 50 net
Dixon's plumbago ....℔ lb 8c. net

Trowels.

Lothrops' Brick and Plastering.....dis 25
Reed's Brick and Plastering..... .....dis 25
Disston's Brick and Plastering... dis2o
Brade's brick..... ..... dis 20

Tacks, Brads, &c.

New List, September 1. 1882. & Supplement Jan-1, 1886.

American iron carpet tacks all kinds dis..72½&10
Steel carpet tacks all kinds.....72½&10@10
Swedes Iron carpet tacks all kinds ..... 72½&10
Swedes iron tacks.....67½&10
Swedes iron Upholsterers' tacks.....67½&10
Tinned Swedes iron tacks.....67½&10
inned Swedes iron Upholsterers' tacks ....67½&10
American iron cut tacks .....70&10
Copper tacks .....33⅓&10
Copper finishing and trunk nails.....33⅓&10
Cigar box nails .....45&10
Finishing nails. .....60&10
Hungarian nails and miners' tacks.....60&10
Gimp and lace tacks.....67½&10
" " " tinned.....67½&10
Trunk and clout nails.....60&10
Tinned trunk and clout nails.....60&10
Basket nails.....60&10
Chair nails .....60&10
Common and patent brads.....60&10
Tinned capped trunk nails.....60&10

Tinware.

Stamped, Japaned & Pieced, list Jan 20, 1887..... .....dis 70&10

Tobacco Cutters.

Enterprise Mfg. Co (Champion).....dis 20&10@30

Traps.

Game, Newhouse.....dis 35
Victor.....60&10
Wood, mouse.....15c ℔ doz holes
Delusion, mouse.....℔ gross $18 00 dis 15

Transom Lifters.

Wollensak's Patent..... dis 50

Twine.

	BC.	P.
No. 12, Flax Twine, ¼ and ½ lb Balls...	21½c	27c
No. 18, " " ¼ and ½ "	21½c	27c
No. 36, " " ¼ and ½ "	20c	25c
2-Ply Hemp, ¼ and ½ lb Balls (Spring Twine)	17	
3-Ply " 1 lb Balls.....	17½c	
3-Ply " 1½ lb Balls	16c	
Cotton Wrapping, 5 Balls to lb.....	15@16c	

Vises.

Solid box.....50&10&5@60
Parker's.....discount 20@25
Prentiss..... " 20 &5@25
Stephen's..... " 25
Saw Filers, Wentworth's .....dis20&10
Saw filers, Stearn's .....33⅓&10

Washer Cutters.

Smith's Patent .....℔ doz $12 00, dis 20&10&10
Johnson's.....℔ doz $11 00, dis 33⅓
Penny's.....℔ doz Pol. $14 00; Jap'd. $16 00, dis 55
Appleton's.....℔ doz $16 00, dis 60&10
Bonney's.....dis 30&10

Well Wheels.

8 in., $2.00; 10 in., $2.50; 12 in., $3.25

Wire. New List Jan. 18. 1884

Brass and Copper.....discount 20
Bright and annealed, Nos. 0 @18 ... dis 70&5@72½
" " " Nos. 19 @ 26.....dis 72½@75
" " " Nos. 27 @ 36 dis 75@75&10
Coppered Nos. 0 to 18, market list.....dis 65&10@70
Galvanized Nos. 0 to 18 " " dis 60&7½@65
Tinned market Nos. 0 to 18,..... dis 65
Cast steel .....dis 50
Tinned Broom Wire.....dis 70@72½
Annealed Fence, Nos. 8 and 9..... dis75
Annealed Grape, Nos. 10 to 14..... dis 75
Stubs Steel Wire regular.....$6 00.@lb dis30

Wrenches.

Coe's genuine, cash in 10 days..... 55 & 3
Girard Standard.....discount 70&10
Agricultural.....discount 75&10
Mechanics' .....dis 55&10 & 3
Bemis & Call's Combination.....25&10
Donohue's Engeneers'.....25

TINNERS' STOCK.

Tin.

Banca 25
Straits.....24½
English 24½
Bar.....26

Spelter.

American, cash. ℔ lb.....

Charcoal Tin Plate.

IC 12x12 225 sheets..... $6 00@6 50
IX 14x20 112 sheets..... 7 25@8 00
IC 10x14 225 sheets.....℔ box 5 75@6 25
IC 20x28 112 sheets..... 12 25@14 00
IX 10x14 225 sheets ..... 7 25@8 00
IX 12x12 225 sheets ..... 7 75@8 25
For each additional X add $1.90@3.00

Coke Tin Plate.

	Best	Ordinary
IC 10x14 } IC 14x20 }	$5 60	

Solder.

Half and Half, in bars warranted } Quotations only application.
No. 1, Refined.....
Bingham.....

Zinc.

inc, cask.....6¼
inc, open.....7

LEAD.

Pig..... } No quotations. Market excited and declining.
Bar. ℔ lb.....
Pipe. ℔ lb.....
Sheet. ℔ lb.....
Chilled Shot ℔ bar 25 lbs.....

BABBIT METAL.

No. 4.....6
Allens.....9¼
Excelsior.....15
W. B. Genuine.....25

COPPER.

Lake Ingot..... 17½
Arizona..... 16¼

IRON AND STEEL.

Flat Bar

1¼ to 4 by ⅜ to 1 inch.....1 85
4½ to 6 by ⅜ to 1 inch.....1 95
1¼ to 6 by 1½ to 2 inch.....2 25
1¼ &1¾ by ⅜ to ¾.....1 95
1 &1⅛ by ⅜ to ¾.....1 95
⅝, ¾ and ⅞ by ⅜ to ⅝.....2 35

Round and Square.

1 to 1⅛ inch.....1 85
2 to 2⅛ 2 05
2¼ to 3¼ inches.....2 35
3⅜ to 4 .....2 85
4¼ to 4½ 3 35
4¾ to 5 .....3 55

Oval.

⅜ to 1¼ inch.....2 25
⅞ to ¾ 2 45
⅞ 2 65
¾ 3 95

Half Oval and Half Round.

1¼ to 3 inch.....2 95
⅞ to 1¼ 2 55
⅜ to ¾ 3 05
⅞ 3 35
¾ 4 85

Heavy Band.

1⅛ to 6 by ¼ and 5-16 inch.....2 0
1 to 1⅜ by ¼ and 5-16 inch.....2 15
⅜ to ⅞ by ¼ and 5-16 inch.....2 35
⅞ to ⅝ by ¼ and 5-16 inch.....2 85

Hoops.

1¼ to 4, Nos. 13 to 15.....2 65
1¼ to 2, Nos. 16 to 18.....2 75
1¼ to 2, No. 19.....2 85
1¼ to 2, No. 20.....2 95
1¼ to 2, No. 21.....3 05
1¼ to 2, No. 22.....3 15
15-16, 1 and 1⅛, Nos. 13 to 15.....2 85
15-16, 1 and 1⅛, Nos. 18 to 18.....2 95
15-16, 1 and 1⅛, Nos. 19 and 20.....3 05
15-16, 1 and 1⅛, No. 21.....3 15
15-16, 1 and 1⅛, No. 22.....3 35
⅞, Nos. 13 to 15.....3 05
⅞, Nos. 16 to 18.....3 15
⅞, Nos. 19 and 20.....3 25
⅞, No. 21.....3 35
⅞, No. 22.....3 45
13-16, Nos. 13 to 15.....3 25
13-16, Nos. 16 to 18.....3 35
13-16, Nos. 19 and 20.....3 45
13-16, No. 21.....3 55
13-16, No. 22.....3 65
¾, Nos. 13 to 15.....3 35
¾, Nos. 16 to 18.....3 45
¾, Nos. 19 and 20.....3 55
¾, No. 21.....3 65
¾, No. 22.....3 75
11-16, Nos. 13 to 15.....3 55
11-16, Nos. 16 to 18 .....3 65
11-16, Nos. 19 and 20.....3 75
11-16, No. 21.....3 85
11-16, No, 22.....3 95
⅝, Nos. 13 to 15.....3 85
⅝, Nos. 16 to 18.....3 95
⅝, Nos. 19 and 20.....4 05
⅝, No. 21.....4 15
⅝, No 22.....4 25
⅝, No 23.....4 35

Light Band

1¼ to 6 by ¼ to 3-16 in.....2 35
1½ to 6 by Nos 11 and 12.....2 45
1 to 1⅜ by ¼ to 3-16 in.....2 45
1 to 1⅜ by Nos. 11 and 12.....2 55
⅞ and 13-16 by ¼ to 3-16 in.....2 75
⅞ and 13-16 by Nos. 11 and 12.....2 85
¾ and 11-16 by ¼ to 3-16 in.....3 05
¾ and 11-16 by Nos. 11 and 12.....3 15
⅝ and 9-16 by ¼ to 3-16 in.....3 35
⅝ and 9-16 by Nos. 11 and 12.....3 49
½ by ⅛ to 3-16 in.....3 60
½ by Nos. 11 a d 12.....3 70

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12.....2 85
⅛ inch, " " " 13 and 14.....3 15
¾ inch, " " " 11 and 12 .....3 15
¾ inch, " " " 13 and 14.....3 35

Sheet Iron.

No. 10 to 4.....2 55
No. 15 to 17.....2 75
No. 18 to 21.....2 85
No. 22 to 24.....2 95
No. 25 to 26.....3 05
No. 27.....3 15
No. 28 .....3 35

Iron Boiler Plates.

Tank, ¼ inch and heavier.....2 45
C No. 1, " 2 70
C H No. 1, " 2 95
C H Flange, " 3 65
Extra Flange, " 4 05
Solid Fire Box, " 4 95

Steel Boiler Plates—1-4 in. and heavier.

Tank $2 55
Shell $3 05
Flange.....$3 30
Marine Flange.....$3 80
Fire Box.....$4 45
Above includes plates 90 inches wide.
90 to 96 in. wide..... ½c. ℔ extra.
96 to 100 in. wide..... 1 c. "
100 to 104 in. wide.....1½c. "
104 to 116 in. wide.....special.

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔
to 2 in. inclusive.....	.09
9-16 to ½ in. "	.09
7-16 to ⅝ and 2⅛ to 3 in.....	10½
3⅛ to 4 in.....	10
⅝ to 11-16 an 4½.....	11½

TRAVELER'S REGISTER.

Standard Time.
Revised March 6th, 1888.

N. Y. C. & St. L. R. R. Co.— "The Nickel Plate."

EASTWARD.	ARRIVE.	DEPART
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 40 p m	5 45 a m
WESTWARD.	ARRIVE.	DEPART.
Chicago Passenger	.....	6 30 a m
Fostoria Passenger	4 46 p m	4 51 p m
Local Freight	5 20 p m	5 50 a m

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.
Euclid Accommodation departs 6:24 a. m. 12:10 a. m., 5:05 p. m.
All trains daily, except Sunday.

Cleveland & Pittsburg.

	ARRIVE.	DEPART.
New York Express	12 45 p m	7 45 a m
New York Express	6 55 p m	1 40 p m
Alliance & Akron Accom.	9 35 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	* 5 25 a m	*11 10 p m

*Daily; all other trains daily except Sunday.

Mt. Vernon & Pan Handle Route

C., A. & C. Ry. Co.	ARRIVE.	DEPART.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col' & Cin. Night Express	7 30 a m	8 00 p m
Akron & Columbus Exp	12 45 p m	1 40 p m
Akron & Orrville Accom	9 35 a m	3 25 p m

The 8 p. m train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily except Sunday.

Erie Railway.
Depot, South Water St. and Viaduct.

	ARRIVE.	DEPART.
N. Y. & Pitts. Express	15 58 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommodation		†6 40 a m
Pittsburgh Express	† 6 25 p m	
Youngstown Local	†8 05 a m	
Mahoning div. and Pitts Local		*11 40 a m
Mahoning Val Accom		*4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	

* Daily. † Daily except Sunday. ‡ Daily except Monday.

Lake Shore & Michigan Southern Railroad.

TRAINS GOING EAST.	Arrive from West.	Depart East.
No. 4, Fast Limited Ex	2 55 a m	*2 55 a m
No. 6, N. Y. & Bos. Ex	*1 35 a m	*1 40 a m
No. 8, N. Y. B't'd & At Ex	*8 25 a m	*8 50 a m
No. 36, Elyria Accom	†7 45 a m	.....
No. 10, Toledo & Sandusky Accommodati'n	†11 05 a m	.....
No. 24, Buffalo Accom	.....	†7 00 a m
No. 10, N. Y. & Boston "Flyer,"		*11 50 a m
No. 12, N. Y. & Bos. Ex.	*2 35 p m	*3 00 p m
No. 2, Night Express	†9 40 p m	†10 00 p m
No 26, Conneaut Accom	.....	†4 25 p m

TRAINS GOING WEST.	Arrive from East.	Depart West.
No. 1, Fast Limited Ex	*12 15 a m	*12 15 a m
No. 23, Cleveland Express	*2 15 a m	
No. 3 Chi. Ex. via Sand'y	15 30 a m	†5 45 a m
No. 25, Mich. Ac. via Norw'k	.....	†5 45 a m
No. 21, Toledo Ex. via Norwalk and Sandusky	†12 50 p m	†3 20 p m
No. 5, Fast St. Louis & Chicago Ex. via Sandusky	*10 50 a m	*10 55 a m
No. 9, Chi. Pac. Ex. via Nor'k	*6 55 p m	*7 15 p m
No. 31, Elyria Accommodation, to Elyria only	.....	†4 30 p m
No. 27, Conneaut Accom	†8 10 a m	.....

Sunday train for Nottingham— Depart 8:15 a. m. and 1:00 p. m.; arrive 9:20 a. m. and 4:45 p. m.
Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.
A local Cleveland and New York Sleeper and dining car daily on No. 10, leaving Cleveland at 11:50 a. m., arrives Grand Central Depot, New York 7:30 a. m.
For further information as to trains, connections and sleeping car berths apply at the City Ticket Office 289 Bank St., Mercantile Bank building. Telephone 669.

M. E. GAUL, City Pass. Ag't. A. J. SMITH, Gen'l Pass. & Ticket Ag't.

Cleveland and Canton Railroad.

Arrive.—Canton, Sherrodsville and Coshocton 9 55 a.m., 7 00 p.m.
Kent —*7 50 a.m., *7 16 p.m.
Bedford—*7:50 a.m., 1:05 p.m., 7 16 p.m.
Newburgh and Miles avenue—7:10 a.m., 4:15, p.m. 5:33 p.m.
Depart—
Canton, Sher'dsville & Cosh't'n—7:00 a.m. and 3:10 p.m.
Kent—*8:38 a.m. and *8:30 p.m.
Bedford—*8:38 a.m., 4:45 p.m., 11:10 a.m., 5:45 p.m.
Newburgh and Miles Avenue—6:12 a.m., 2:00 p.m., 4:40 p.m.
Trains marked with * run daily. All others daily except Sunday.
Depot at Ontario street, one block north of Huron street

Cleveland, Lorain and Wheeling.

	DEPART.	ARRIVE.
Wheeling Express	6 45 p m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

Pittsburgh & Lake Erie Railroad.

On and after Jan. 2 1888, passenger trains will depart from and arrive at the Pittsburgh and Lake Erie Depot at Pittsburgh, as follows, Central time:

P. & L. E. R. R. Depart for—
No. 1, Cleveland, Bradford and East..... 5 25 a.m
No. 5, Buffalo, St. Louis, Cleveland..... 7 45 a.m
No. 5, Beaver Falls Accommodation..... 8 40 a.m
No. 7, Buffalo, New York, and all New England points..... 10 15 a.m
No. 9, Chicago, Cincinnati, St. Louis,... 1 10 p.m
No. 11, Buffalo Express..... 3 30 p.m
No. 13, Beaver Falls Accommodation..... 5 20 p.m
No. 15, Buffalo Express..... 10 30 p.m

Arrive from—
No. 2 Beaver Falls Accommodation..... 5 25 a.m
No. 4, Buffalo and Cleveland Night Exp. 6 55 a.m
No. 6, Youngstown Accommodation..... 9 20 a.m
No 8 Beaver Falls Accommodation..... 12 40 p.m
No. 10, Chicago, Cincinnati & St. Louis, 1 35 p.m
No. 12, Buffalo Express..... 5 45 p.m
No. 14, Cincin..St Louis and Cleveland, 8 05 p.m
No. 14, Cleveland & Buffalo Express..... 10 35 p.m

Pittsburgh & Lake Erie trains Nos. 4, 15, 8 and 10 daily.

E. HOLBROOK, General Superintendent.
R. W. JONES, Master of Transportation.
D. SMITH, Gen'l Pass, Ag't, Pittsburgh.

WHEELING & LAKE ERIE

TIME TABLE—IN EFFECT JAN. 8, 1888.
Central Standard Time.

EASTWARD.	No. 5.	No. 7.	No. 9.*	No. 13*
Toledo.....lv	7 45 AM	1 10 PM	4 50 PM	7 45 PM
Oak Harbor..ar	8 41	2 05	5 45	10 0
Fremont	9 06	2 30	6 10	1 45
Clyde	9 22	2 47	6 25	11 15
Bellevue	9 37	3 03	6 40	11 40 PM
Monroeville..lv	9 55	3 20	6 8	3 10 AM
Norwalk	10 10	3 40	7 15	3 22
Wellington	11 00	4 32	8 08	4 00
Creston	11 53	5 20	9 05 PM	4 47
Orrville.....ar	12 20 PM	5 48	9 40 PM	5 15*
Orrville.....lv	12 40	5 53	7 05 AM	7 05
Massillon.....ar	1 20	6 35	7 52	7 52
Massillon.....lv	1 20	6 35	7 52	7 52
Navarre	1 35	6 50	8 10	8 10
Valley June.lv	2 20	7 35	8 55	8 55
New Cumberl'd	2 23	7 48	9 10	9 10
Sherrodsville	2 45	8 00	9 25	9 25
Leesville	2 51	8 08	9 40	9 40
Bowerston....ar	2 58PM	8 15PM	9 50AM	9 50AM
Canal Dover	2 57 PM			
New Comerst'n	3 8			
Cambridge	4 35			
Macksburg	6 02			
Marietta.....ar	7 15 PM			

WESTWARD.	No. 6.	No. 8.	No. 4.	No. 2.*
Marietta.....lv	6 45 AM	2 20 PM		
Macksburg	7 55	1 30		
Cambridge	9 25	3 00		
New Comerst'n	10 23	3 58		
Canal Dover	11 04 AM	4 34PM		
Bowerston	1 25 AM	3 45PM	5 55 AM	
Leesville	11 32	3 55	6 02	
Sherrodsville	11 40	4 10	6 10	
New Cumberl'd	11 52	4 25	6 22	
Valley June	12 20 PM	5 02	6 45	
Navarre	12 50	5 35	7 35	
Massillon	1 05	5 50	8 00	
Orrville.....ar	1 40	6 25	8 55	
Orrville.....lv	1 45	6 35*	9 13	
Creston	2 18	7 02	9 42	
Wellington	3 05	7 43	10 33	
Norwalk	3 55	8 25	11 30	7 25 AM
Monroeville	4 07	8 35	11 45	7 35
Bellevue	4 23	9 45	11 59	7 51
Clyde	4 39	10 00	12 15 PM	8 06
Fremont	4 55	10 17	12 30	8 23
Oak Harbor	5 20		12 53	8 45
Toledo.....ar	6 20 PM	11 15*	1 50 PM	9 40 AM

No. 7	No. 25	Huron Div'n.	No. 26	No 28
4 50 PM	7 40 AM	Ar. Huron ..Lv	8 55 AM	5 30 PM
4 32	7 22	Friese Landing	9 10	5 45
4 20	7 10	.....Milan	9 28	6 03
Lv 3 5	Lv 6 45	.....Norwalk	Ar 9 55	Ar 6 30
Ar PM	Ar AM	Monroeville	Lv AM	Lv AM

* Daily.
Train No. 13 leaves Toledo *7 45 p. m.; arrive Monroeville 12 15 a. m and Norwalk 12 35 a. m
This road is now open through from Toledo to Bowerston, connecting with the Pennsylvania System for all points East.

THROUGH CAR SERVICE.
Between Toledo, Cambridge and Marietta.
" " and Bowerston.
" " and Akron, Youngstown and Pittsburgh.
" Chicago, Akron, Youngstown and Pittsburgh.

M. D. WOODFORD, Gen'l Manager. JAMES M. HALL Gen'l Pass. Agt.

Scioto Valley Railway

TIME TABLE.
In effect May 27, 1888.
THE SHORT LINE TO ALL POINTS
North and South, East and Southeast, West and Northwest.

TRAINS GOING SOUTH

STATIONS.	No. 2.	No. 4.	No. 6.
Columbus.....Lv	7 10 a.m	11 25 a.m	5 25 p.m
Valley Crossing	7 30 "	11 44 "	5 45 "
Lockbourne	7 41 "	11 53 "	5 56 "
Ashville	7 55 "	12 07 p.m	6 10 "
Circleville	8 15 "	12 26 "	6 30 "
Kingston	8 34 "	12 44 "	6 49 "
Chillicothe	9 01 "	1 30 "	7 35 "
Sharon	9 36 "	2 05 "	8 10 "
Waverly	9 46 "	2 14 "	8 20 "
Piketon	9 58 "	2 27 "	8 33 "
Big Run	10 12 "	2 41 "	8 47 "
Lucasville	10 27 "	2 57 "	9 03 "
Portsmouth	10 50 "	3 20 "	9 25 "
Sciotoville	11 05 "	3 35 "	9 40 "
Wheelersburg	11 10 "	3 40 "	9 45 "
Havernill	11 29 "	3 59 "	10 04 "
Hanging Rock	11 40 "	4 10 "	10 15 "
Ironton	11 50 "	4 20 "	10 25 "
Petersburg	12 00 m.	4 30 "	10 35 "
Ashland.....Ar	12 30 p m	5 00 p.m	11 05 p.m

Trains Nos. 2 and 4 daily, except Sunday.
Train No. 6 daily.
Train No. 6 takes supper at Chillicothe.

TRAINS GOING NORTH.

STATIONS.	No. 1.	No. 3.	No. 5.
Ashland.....Lv	2 45 a.m	9 05 a.m	5 35 p.m
Petersburg	3 15 "	9 35 "	6 05 "
Ironton	3 26 "	9 46 "	6 15 "
Hanging Rock	3 36 "	9 56 "	6 25 "
Havernill	3 48 "	10 07 "	6 36 "
Wheelersburg	4 06 "	10 28 "	6 55 "
Sciotoville	4 12 "	10 33 "	7 00 "
Portsmouth	4 27 "	10 05 "	7 15 "
Lucasville	4 49 "	11 14 "	7 37 "
Big Run	5 04 "	11 32 "	7 53 "
Piketon	5 18 "	11 48 "	8 07 "
Waverly	5 30 "	12 01 p.m	8 20 "
Sharon	5 40 "	12 11 "	8 30 "
Chillicothe	6 35 "	1 10 "	9 06 "
Kingston	7 01 "	1 26 "	9 31 "
Circleville	7 20 "	1 36 "	9 49 "
Ashville	7 40 "	1 55 "	10 08 "
Lockbourne	7 55 "	2 15 "	10 22 "
Valley Crossing	8 06 "	2 39 "	10 31 "
Columbus.....Ar	8 20 a.m	3 00 p.m	10 50 p.m

Train No. 1 daily.
Trains Nos. 3 and 5 daily, except Sunday.

COUPON TICKETS, by the best routes and to all principal points in the United States and Canada, can be found at the following Stations: Columbus, Circleville, Kingston, Chillicothe Waverly, Portsmouth, Ironton, A. C. & I. Ashland.
For further information relative to rates, connections and through time, call on your Ticket Agent, or address J. ROBINSON, Receiver.
JNO. J. ARCHER, Gen'l Pass. & Ticket Ag't, Columbus, Ohio.

Ft. Wayne, Cincinnati & Louisville RAILROAD.

THE POPULAR ROUTE
BETWEEN THE
NORTH and SOUTH
THE DIRECT ROUTE TO OR FROM
FORT WAYNE,
INDIANAPOLIS,
TERRE HAUTE,
EVANSVILLE,
AND ST. LOUIS.

13 MILES SHORTER —BETWEEN— **13**
Fort Wayne and Indianapolis
Than any other Route.

22 MILES SHORTER AND QUICKER **22**
By 3 HOURS, Between
Louisville and Fort Wayne.

Ask for Tickets
—VIA—
Ft. Wayne, Cincinnati & Louisville Railroad.

For sale by all Agents of connecting lines.
EAST, WEST, NORTH AND SOUTH.
W. W. WORTHINGTON, Gen'l Supt. S. A. WIKEL, Gen'l Ticket Agent, FORT WAYNE, IND.

The Picturesque Lehigh Valley Route.

Two through trains with Pullman cars attached are now run via by this beautiful scenic route, between Suspension Bridge, Buffalo, New York and Philadelphia, leaving Suspension Bridge 8:35 A. M. and 3:40 P. M., Buffalo 9:15 A. M. and 5:15 P. M., connecting with all trains from the West.

Passengers between the East and West passing over the famed LEHIGH VALLEY ROAD will experience the pleasure of a trip through the most magnificent and picturesque scenery in the world, presenting an ever varying panorama of delightful surprises.

Double track, steel rails, magnificent road bed and unrivaled equipment, all combine to make the LEHIGH VALLEY the favorite and most desirable route between the East and the West.

Anthracite Coal is used entirely, guaranteeing the passengers perfect freedom from the dense volumes of smoke that so greatly annoy passengers on lines using Bituminous Coal.

E. B. BYINGTON,
Gen'l Pass. Agent Bethlehem, Pa.

Expiration Registers.

MANUFACTURERS' and Dealers' Insurance Registers with special ruling for number of Policy, Company, seven spaces for amounts on different property, amount of policy, amount of premiums, time of expiration, etc., will be sent post-paid on receipt of $1 00. Or we will give one as a premium with each new subscription to the IRON TRADE REVIEW, price $3.00 per year.

Address,

Cleveland Printing and Publishing Co.

Cleveland, Ohio.

Detroit & Cleveland STEAM NAVIGATION CO.

Week Days **FOR DETROIT** 9.00 P. M.

Special Sunday Night and Thursday Morning Trips, July and August.

Four Trips **For Mackinac** per Week,

and Lake Huron Way ports.

All Departures from 23 River Street.

E. B. WHITCOMB, G. P. A. T. F. NEWMAN, G. A

VALLEY RAILWAY.

Depot foot South Water Street

	Arrive.	Depart.
Valley Junction Mail	*7 30 a m	*7 20 p m
Marietta Express	† 1 00 a m	†5 50 p m
Canal Dover Express	* 4 30 p m	*10 00 a m
Akron & Cleve. Accom	* 7 45 p m	*7 45 a m

*Daily.
†Daily. except Sunday.

WM. THORNBURGH, General Manager. R. A. CARRAN, Gen. Pass. Ag't.

THE FAVORITE ERIE RAILWAY AND Picturesque Route TO New York, Boston and the East.

THE SHORTEST AND QUICKEST ROUTE TO PITTSBURGH, WASHINGTON AND BALTIMORE, AND THE SOUTHEAST.

Change of time goes into effect May 20, 1888.
Central, or Ninetieth Meridian time, 33 minutes slower than Cleveland city time.
Until further notice trains will leave from the New Central Depot, South Water Street and Viaduct, as follows:

	Depart.
No. 62, Mahoning Valley Accommo	† 6 40 a m
No. 72, New York Express	* 8 30 a m
No. 72, Fast Pittsburgh Express	* 8 30 a m
No. 64, Fast New York Express	* 3 00 p m
No. 64, Pittsburgh Express	* 3 00 p m
No. 66, Youngstown Accommo	* 5 00 p m
No. 68, Pittsburgh Express	†11 10 p m
No. 68, New York Express	†11 10 p m
No. 70, Pittsburgh Local Express	*11 40 a m
No. 74, Shenango Valley Express	† 4 00 p m
	Arrive.
No. 73, Shenango Valley Express	† 9 25 a m
No. 61, New York Express	† 5 45 a m
No. 61, Pittsburgh Express	† 5 45 a m
No. 65, Fast New York Express	*10 55 a m
No. 65, Pittsburgh Express	*10 55 a m
No. 67, Pittsburgh Express	† 1 20 p m
No. 63, New York Express	* 7 05 p m
No. 69, Pittsburgh Express	* 8 40 p m
No. 77, Youngstown Local	* 7 25 a m
No. 13, Erie Express, carrying express matter only, from all points East and South-east, carries no passengers (except Monday)	† 1 20 p m

* Daily. † Daily, except Sunday.

This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City and intermediate points without change. No change to Boston and New England cities.
Baggage checked through to all points East.
Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Central Depot, South Water street and Viaduct, Cleveland. Ship by Erie Express.

E. B. THOMAS, 2d Vice President, Cleveland, O.
L. P. FARMER, Gen'l Pass. Agent, New York.
W. C. RINEARSON, Ass't G. P. A., Cincinnati, O
M. L. FOUTS, City Passenger Agent, 141 Superior Street, Weddell House, Cleveland, O.

Cleveland & Marietta R. R.

THROUGH LINE BETWEEN
Marietta, Caldwell, Cambridge, Newcomerstown, Canal Dover, Canton, Akron, Cleveland, Buffalo, Toledo, Pittsburgh, New York, Coshocton, Newark, Zanesville, Columbus, Chicago and St. Louis.

In effect April 22d, 1888.

GOING NORTH.			GOING SOUTH.	
No. 4.	No. 2.	STATIONS.	No. 1.	No. 3.
9 55 AM	2 00 AM	..Parkersburg..	2 45 PM	1 55 AM
12 40 PM	6 45	.....Marietta.....	10 15 AM	7 13 PM
12 40	7 05	.....Caywood....	9 55	6 53
12 46	7 11	.....Stanley.....	9 49	6 47
1 00	7 25	.....Whipple.....	35	6 32
1 10	7 35	.....Warner.....	9 25	6 22
1 23	7 48	.....Elba.....	9 12	6 09
1 30	7 55	...Macksburg...	9 05	6 02
1 37	8 01	...Dexter City..	8 58	5 55
1 41	8 05	...South Olive...	8 54	5 50
1 48	8 12	.....Dudley.....	8 47	5 43
1 57	8 20	.....Caldwell....	8 40	5 36
2 07	8 30	..Belle Valley...	8 30	5 26
2 17	8 40	..... Ava.....	8 19	5 16
2 29	8 52	...Pt. Pleasant...	8 07	5 04
2 42	9 04	.....Byesville....	7 53	4 50
3 00	9 25	...Cambridge....	7 36	4 35
3 07	9 32	.....Oldham's....	7 27	4 27
3 14	9 40	..... Miller's....	7 20	4 21
3 24	9 50	...Kimbolton....	7 10	4 10
3 39	10 05	.....Guernsey....	6 56	3 55
3 47	10 12	.....Post Boy....	6 49	3 47
3 58	10 23	..N. Comerstown	6 40	3 38
4 05	10 30	..... Wolf's	6 31	3 29
4 17	10 43	..Phillipsburg..	6 20	3 17
4 22	10 48	..Black Band	6 14	3 12
4 28	10 54	... Turner's	6 09	3 06
4 38	11 04	..Canal Dover..	6 00 AM	2 57
5 00	11 27	ar. Vall'y J'n. lv		2 35
5 02	11 35	lv. Vall'y J'n. ar		2 21
	12 19 PM	.....Canton.....		1 50
	1 12	..... Akron.....		12 31
	2 30	... Cleveland....		11 20 AM
	8 00	.....Buffalo		5 40
11 15 PM	6 20	.....Toledo.....		7 45

Train No. 8 leaves Marietta at 1 40 p. m. Whipple 2 40, Warner 3 00, Elba 3 20, Macksburg 3 35, Dexter City 3 47, Caldwell 4 25, arriving Cambridge 6 30 p. m. Train No. 5 leaves Valley Junction at 5 15 p. m., arriving at Canal Dover 5 30 p m
Through coaches on trains Nos. 2 and 3 between Marietta, Canton, Akron, Cleveland and Toledo. Close connections made at Marietta with C., W. & B., M., C. & N., Z. & O., and Ohio River Packets; at Cambridge with B. & O., east and west; at Newcomers town with P., C. & St. L., east and West; at Canal Dover with C., L. & W. and C. & P., north and east; at Valley Junction with W. & L. E. and Valley R'y.

A. T. WICKOFF, Gen. Manager. W. K. RICHARDS, Gen. Pass. Agt.

½ to 6 in	11½
¼ to 9-32 and ½ to 7 in	12
3-6 in	14

Flats.

	cts. lb
2 to 9-16 wide by 2 to ⅝ thick	0

Bessemer and O. H. Steel.

	cts. lb.
Machinery base price.	0 2½
Tire	02¾
Spring	03¼
Sleigh Shoe	02¾
Toe Calk	03
Cutter Shoes, tapered and barr	03

For extra sizes, see classification below.

Machinery Steel.

ROUNDS AND SQUARES.

	cts. per lb ex.
1 to 3 in. incl.	base
3⅛ to 4 "	0.3
4⅛ to 6 "	1.0
⅝ to 15 16 "	0.2
½ to 11-16 "	0.3
⅝ to 7-16 "	0.4
5-16 to 11-32 "	0.5
¼ and 9-32 "	0.7

Machine cutting, specified lengths, ab'e 24 in. 0.2
Machine cutting, specified lengths, 1 to 24 in. 0.4

Machine cutting to specified lengths less than 12 inches, according to contract, but not less than 0.6 cents on each size extra. Sawing, one-half of the above extra for cutting.

FLATS.

	cts. per lb ex.
1½ to 6 in., by 5-16 to 1 in. thick	base
1¼ to 6 in., by ½ and 9 32 in. thick	0.2
1¼ to 6 in., by 3 16 and 7-32 in. thick	0.3
1¼ to 6 in., by ⅛ and 5-32 in. thick	0.4
¾ to 1 7-16 in., by ¼ to 1 in. thick	0.3
⅝ to 1 7-16 in., by 3-16 and 7-32 in. thick	0.4
⅝ to 1 7-16 in., by ⅛ and 5 32 in. thick	0.5
⅝ to 11-16 in., by ¼ to ½ in. thick	0.4
⅝ to 11-1 in., by 3-16 and 7-32 in. thick	0.7
⅝ to 11 16 in., by ⅛ and 5-32 in. thick	0.8
⅝ to ¾ in., by 1-16 and 3 32 in. thick	2.0
13-16 to 1½ in., by 1.16 and 3- 2 in. thick	1.5
1¼ to 3 in., by 1-16 and 3-32 in. thick	1.0

These extras apply on Tire, Toe Calk, Shoe and Flat Machinery Steel, also on Cutter Shoes.

SPRING STEEL FLATS.

	cts. ex.
1¼ to 4 in. by No. 4 gauge to ½ in. inclusive,	base
1 and ½ in. by No. 1 gauge to 4 gauge "	0.2
1 to 3 in. by No. 5 gauge to 7 gauge "	0.5
⅛ to 3 in. by No. 8 gauge to 10 gauge "	1.0
¾ to 3 in. by No. 11 gauge to 16 gauge "	2.0
¾ to 3 in. by No. 17 gauge to 20 gauge "	3.5
¾ to ⅝ in. by No. 10 gauge to 16 gauge "	4.0
½ to ⅝ in. by No. 17 gauge to 20 gauge "	5.0
⅜ to ⅝ in. by No. 21 gauge to 24 gauge "	6.0

Bessemer and Open Hearth cut to length, 2 inch and over 1-10 cent per lb. extra, and under, by special contract.

ROUND SPRING STEEL.

	cts. ex
⅝ to 1½ inches	base
¼ to 9-16 inches	0.2
⅜ to 7-16 inches	0.5
5-16 inches	1.0
¼ inches	1.5

English Tool Steel.

Jessops	16c
Hob on's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 0
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 0

Rolls and Castings.

Furnace floor and straightening plates	1¼c
Housings and castings not otherwise specified	1¾c
Guide plates	2½c
Spindles and coupling boxes	1¾c
Sand rolls and pinions, large size	2 c
Sand rolls and pinions, small size	2½c
Pipe mill castings	3 c
Rolling mill castings under 50lb	2 c
Spur and bevel wheels, large	3 c
Spur and bevel wheels, small	3½c
Pulleys up to 30 inches	4 c
Pulleys over 30 inches	3½c
Engine castings, light	3¼c
Engine castings, heavy	2¾c

SCRAP IRON AND OLD METAL

	Net Ton.
No. 1 R. R. wrought scrap	$23 00
No. 1 wrought scrap	20 00
No. 1 Machine cast scrap	15 00
Stove plate (free from burnt iron)	10 50
Grate bars	11 00
Pipes and flues (Clean)	13 00
Tank iron	12 50
Hoop and band iron	10 00
Iron axles	28 00
Light sheet iron	10 00
Axle turnings	16 00
Wrought turning (free from cast)	15 00
Wrought iron, oily drillings	14 00
Cast borings	11 00
Malleable iron	10 50
Uncut wrought iron boilers	10 00
Steel boiler plates	14 50
Old iron T rails gross tons	$27 00
Old steel rails	23 00
Car wheels	20 00
Old copper per lb	7
No. 1. H. red Brass	8¼
Heavy yellow brass	6¼
Light yellow Brass	6
Scrap Zinc	3
Tea Lead	3
Heavy Lead	3¼

WROUGHT IRON PIPE.

DISCOUNTS.

	Discount Per Ct.
Wrought iron pipe: Butt black X str	
XX str	50
Wrought iron pipe. Lap black X str	
XX str	60
Wrought iron pipe: Butt galv	40
" " Lap "	50
Lap-welded boiler tubes	50
" drive pipe	
" casing	
Lead pipe per lb	
Sheet lead "	
Galvanized spiral pipe	50
" " fittings	30
Patent adjustable ells	40
Globe ventilators	60
Tin tubing	50
Fittings for same	30
Expanding conductor pipe and fittings	40
Cast iron piece fittings for wrought iron pipe, black and galv	70
Shings and plugs	75

Malleable unions	65
" flange unions	72½
Long screw	70
Gas pipe hooks	50
Cast iron flanges, manifolds and expansion pipe hangers	65
Hook, ring and expansion plates, coil stands	67½
Iron body: Globe, angle, check, cross, safety, butterfly, throttle, back pressure and foot valves	65&10
Iron body: Expansion joints and iron cocks, all iron	65&10
Iron body: Iron cocks with brass plugs	60&10
Straight way valves	
Brass: Globe, angle, check, cross safety, and radiator valves	60&10
Throttle and butterfly valves	5 &10
Brass: Fin. globe valves, with finished brass wheels	40&10
Brass: Steam, service, meter and union meter cocks	57½&10
Brass: Expansion joints and steam bibbs	50&10
Mississippi gauge cocks	55
Bingham "	30
Gas proving pumps	50
Oil cups, lubricators and air cocks	60&10
Cocks for steam gauges	60&10
Cylinder cocks	50&10
Comp. gauge cocks	55&10
Water gauges, steam whistles and whistle valves	60&10
Gas fixture fittings	55
McNamara hydrants and street washers	Spec'l
Stop cock boxes	Spec'l
Galvanized wrought iron range boilers, to 52 gallons	65
Galvanized wrought iron range boilers, larger	50
Stands for same	40
Copper bath tubs	25
Closets	Spec'l
Cast iron soil pipe, to 6 in. inclusive	60
" " fittings, to 6 in. inclusive	65
Cast iron sinks	70
" slop sinks	60
Drive-well points	50
Ground key work: Rough and fin. plain, tray and bath bibbs " " stops, shower stops, hydrant and ball cocks	55&10
Compression: Rough and fin. plain, tray and bath bibbs	50&10
" " stops; urinal, hopper, hydrant and ball cocks	50&10
Basin cocks, from No. 1 to 13 inclusive	50&10
" " above No. 13, and double basin	40&10
Shampooing and sink cocks	40&10
Pantry cocks	50&10
Shampooing sprinklers	50&10
Double bath cocks and chain stays	50&10
Hose goods, plain and water back couplings	55&10
Boiler couplings, ground face, per set net, $1 25	10
Boiler couplings plain face, per set net, $1.20	10
Basin plugs and grates; bath, sink and wash tray plugs	60&10
Soldering nipples and unions	60&10
Union joints	60&10
Sad ferrules; street washer screws, checks and guides	55&10
Hydrant and basin clamps, hydrant sockets	55&10
Pipe taps, reamers and dies	60
Plain pipe tongs and gas pliers	50
Wrenches: Coe	50 & 5
" Girard agricultural	65
" " standard	60 & 5
" Stillson	33⅓
" Armstrong	25 & 5
" Bemis & Call	25 & 5
" Rouse	30
" Bauer s	10
Pipe tongs: Brown's adjustable	50
" Jarecki	50
" Robbins' chain	10
" Brock's	10
Vises: Plain pipe	55
" Smith comb	50
" Parker's comb	50
" Bauer's pipe and bolt	10
Machinists' hammers	40
Corner "	Spec'l
Pipe cutters: Stanwood	20
" Eureka	45
" Saunders	40
" Barnes	50 & 5
Malleable oilers and hand lamps	Spec'l
Screwing stocks	60
Armstrong's adjustable stocks and dies	25&10
Waste, at manufacturer's prices.	
Gas fitters' cement	Spec'l
Hair felt	Spec'l
Riley Bros. cement	Spec'l
Otley Bros. steam packing	Spec'l
Mineral wool	Spec'l
Lubricating compound	Spec'l
Malleable iron fittings, black and galv	25
Wrought iron couplings and nipples, black and galv	70

Standard Wrought Iron, Steam, Gas and Water Pipe.

Nominal Size Inside Diameter	Price per Foot, Black	Price per Foot, Galvanized	Thickness.	Nominal Weight per Foot	No. of Threads per in. of Screw	Price, Extra, Threads.
In			In.	Lbs.		
⅛	0 04	0 06	.068	0 24	27	0 05
¼	0 04	0 05	.088	0 42	18	0 05
⅜	0 04	0 05½	.091	0 56	18	0 05
½	0 05	0 07	.109	0 84	14	0 05
¾	0 07	0 09	.113	1 12	14	0 05
1	0 09½	0 12½	.134	1 67	11½	0 08
1¼	0 12½	0 17	.140	2 24	11½	0 07
1½	0 22	0 25	.145	2 68	11½	0 08
2	0 26	0 32	.154	3 61	11½	0 10
2½	0 44	0 49	.204	5 74	8	0 15
3	0 58	0 64	.217	7 54	8	0 20
3½	0 70	0 86	.226	9 00	8	0 25
4	0 85	1 00	.237	10 66	8	0 35
4½	1 00	1 25	.246	12 49	8	0 45
5	1 20	1 50	.259	14 50	8	0 55
6	1 65	2 00	.280	18 76	8	0 70
7	2 00		.301	23 27	8	0 85
8	2 75		.322	28 18	8	1 00
9	3 70		.344	33 70	8	1 20
10	4 75		.366	40 06	8	1 25
11	5 75		.375	45 02	8	1 50
12	6 50		.375	49 00	8	2 50
13	7 75		.375	54 00	8	
14	9 00		.375	58 00	8	
15	10 00		.375	62 00	8	

Extra Strong, double above list.

Double Extra Strong, double list of Extra Strong.

LAP WELDED BOILER TUBES.

Size, Inside Diameter Inches	1	1¼	1½	2	2¼	2½	3	3¼	3½	4	4½	5	6	7	8	9	10	11	12
Price per foot	23	28	28	32	38	38	38	44	44	52	60	72	100	145	185	232	275	325	375
Price, Lap-Welded Drive Pipe	18	22	22	25	31	31	31	35	35	40	50	66	90	120	165	200	250	300	350

DRIVE PIPE SHOES.

	6"	8"	10"	12"
Long, Separate	13 00	16 00	20 00	25 00
" Shrunk on pipe	16 00	18 00	25 00	30 00
Short, Separate	13 00	14 00	17 00	22 00
" Screwed on pipe	13 00	15 00	19 00	24 00

DRIVE PIPE HEADS.

	6"	8"	10"	12"
	12 00	15 00	18 00	22 00

LAP WELDED CASING.

Size, Inside Diameter Inches	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10
Price per foot	52	60	72	80	90	100	110	120	130	140	150	160	170	180	190
Price, Lap-Welded Casing	46	52	64	70	80	90	100	110	120	130	140	150	160	170	180

Tarred or Asphalt and Kalamein Pipe, list and discount furnished on application.

WEST'S

MOULDERS' TEXT-BOOK:

BEING PART II OF

AMERICAN FOUNDRY PRACTICE.

Presenting best methods and original rules for obtaining good, sound, clean castings, and giving detailed description for making moulds requiring skill and experience.

Also containing a practical treatise upon the construction of cranes and cupolas and the melting of iron and scrap steel in iron foundries. By

THOMAS D. WEST,

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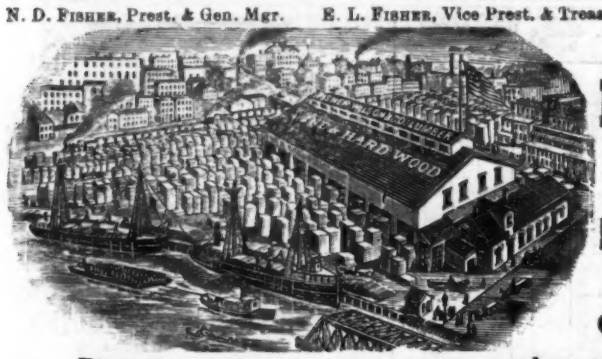

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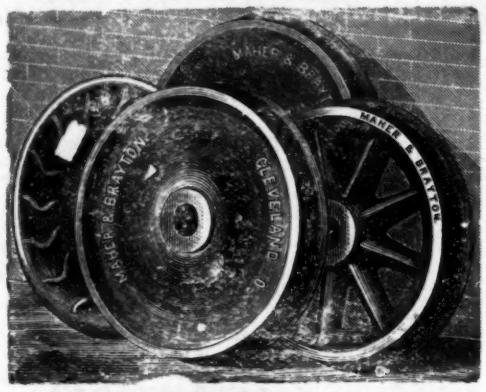

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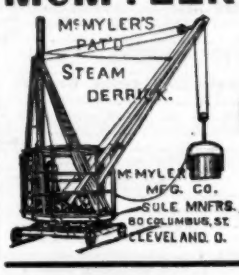

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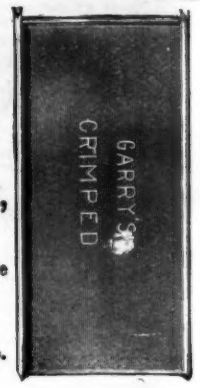

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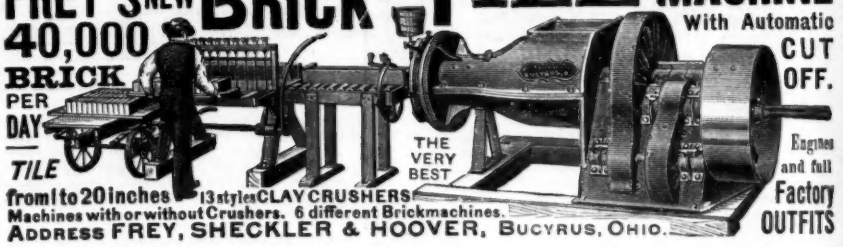

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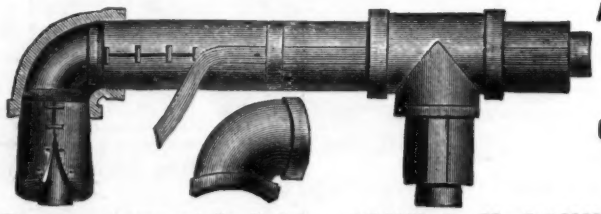

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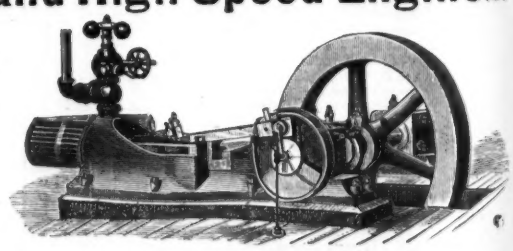

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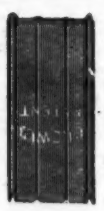

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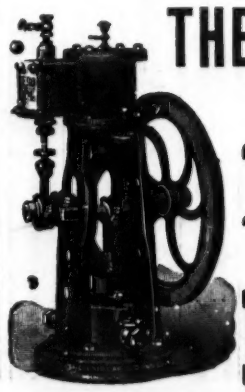

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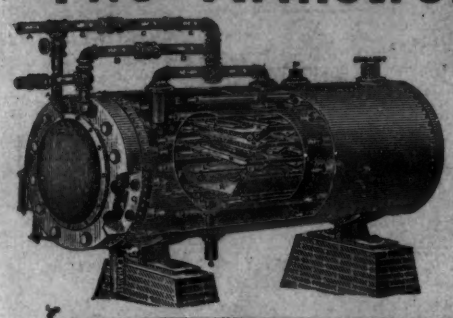

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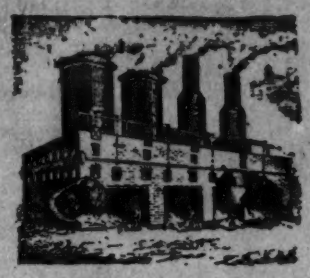

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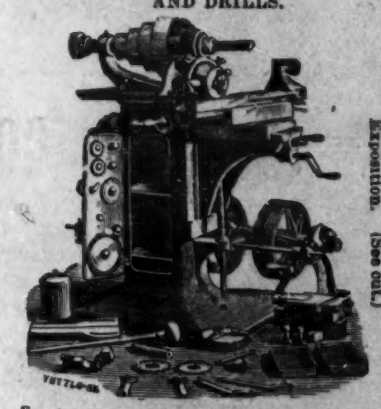

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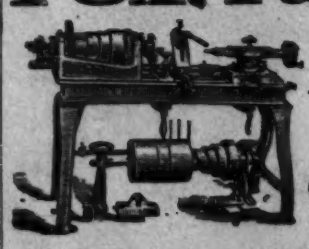

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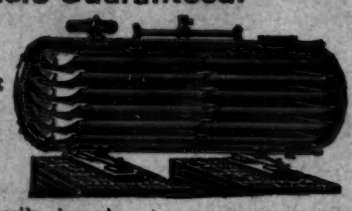

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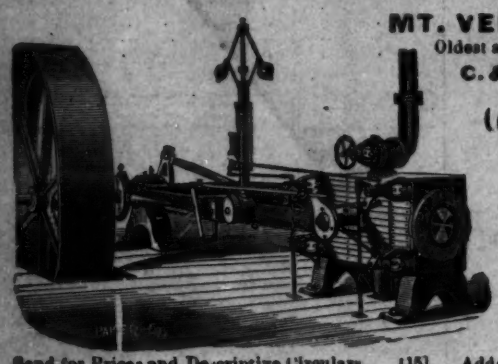

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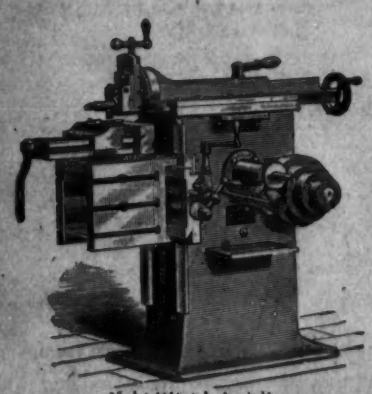

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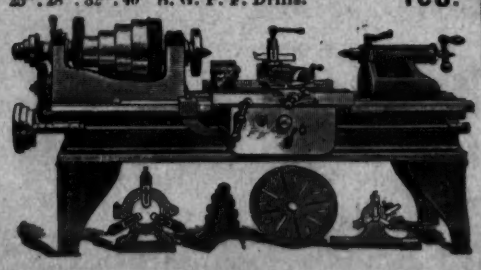

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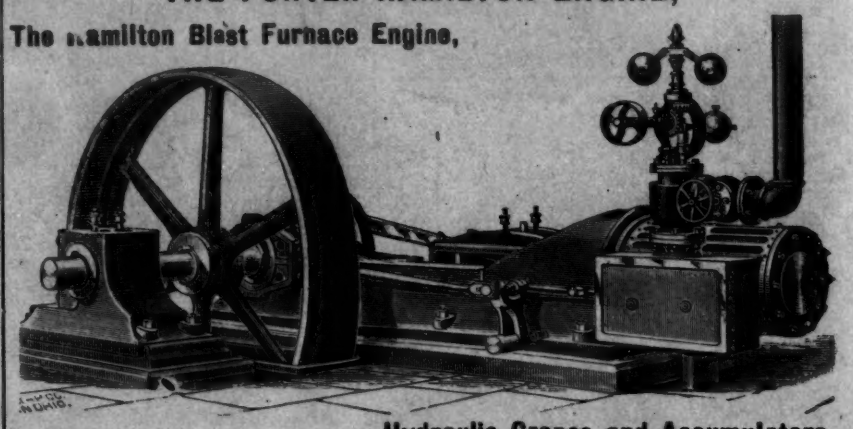

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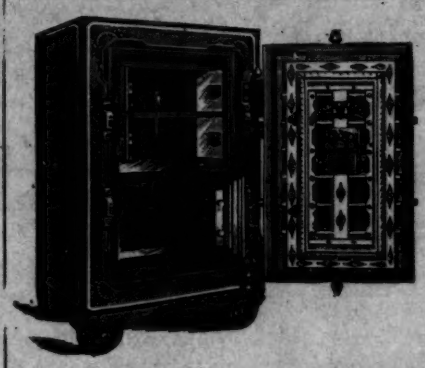

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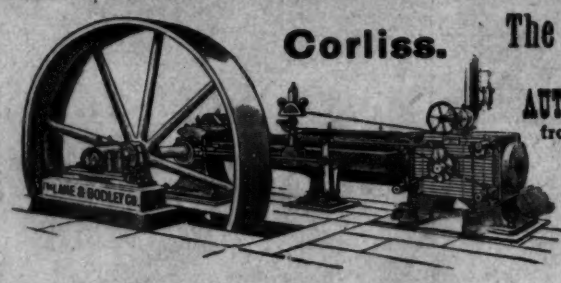

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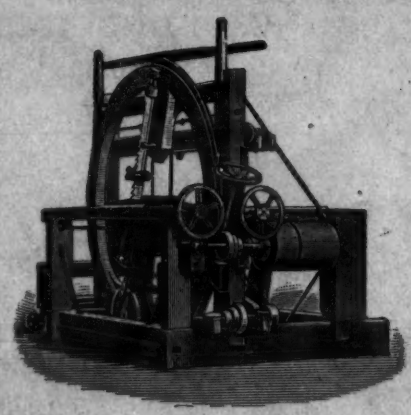

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